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[OFFICIAL NOTICE.]

Fortieth Annual Meeting, New England Association of Gas Engineers.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS,
SECRETARY'S OFFICE, CENTRAL SQUARE,
EAST BOSTON, MASS., Feb. 4, 1910.

The 40th annual meeting of the New England Association of Gas Engineers will be held at Young's Hotel, Boston, Wednesday and Thursday, Feb. 16 and 17, 1910. The following papers have been prepared:

"Management of Water Gas Generators," by Mr. John F. Wing, Everett, Mass.

"Further Data on the Worcester Retort House," by Mr. D. D. Barnum, Worcester, Mass.

"Maintenance and Selling Methods of Gas Lamps," by A. R. Burr, New Haven, Conn.

"Some Single Unit Lighting Installations," by B. J. Bean, East Boston, Mass.

QUESTION BOX.

"How should gas ranges be treated to prevent rust and dingy appearance in daily use?"

Members having questions or topics which they wish discussed will please send them to the Secretary, before the meeting if possible. Those having names to propose for membership should send for application blanks.

The members will dine at 6:30 P.M., Wednesday, at Young's.

All friends of the Association are invited to attend the meeting, even though they may not receive a formal invitation.

N. W. GIFFORD, Secretary.

[OFFICIAL NOTICE.]

Annual Meeting, Southern Gas Association.

SOUTHERN GAS ASSOCIATION,
OFFICE OF THE SECRETARY-TREASURER,
ROME, GA., Jan. 28, 1910.

To the Members of the Southern Gas Association: The Meeting of the Southern Gas Association will be held in Chattanooga, Tenn., during the 16th, 17th and 18th of February, 1910. Headquarters will be at the Hotel Patten. Hotel rates are quoted as follows:

Hotel Patten, European.—Room with bath from $2.50 per day. Room without bath, from $1.50 per day. For second person in room, from $1.50 to $2 per day additional.

Read House, European.—Room with bath from $1.50 per day. Room without bath, from $1 per day.

Hotel Northern, European.—Room with bath from $1.50 per day. Room without bath from $1 per day.

The following papers have been prepared:

"Problems in Gas Illumination," by Mr. Norman Macbeth.

"Gas Coals in the Big Hill District," by Mr. Harry P. Jones.

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"The General Manager of a Small Gas Company," by Mr. W. G. Leet.

"Natural Gas," by Mr. A. G. Curtis.

"Selling Coke in Small Southern Cities," by Mr. E. M. Osbourne.

"The Use of Tar on Roads," by Mr. A. D. Whittaker.

"Public Policy," by Mr. H. M. Moore.

"The Education of the Colored Cook," by Mr. M. A. Bowlin.

"Graphic Analysis of Financial and Operating Reports of a Gas Company," by Mr. J. P. Ingle.

"High Pressure Versus Low Pressure Gas Distribution," by Mr. H. W. Frund.

Negotiations are in progress with the South Eastern and the South Western Passenger Associations regarding railroad rates. These will be announced later by card. Respectfully,

JAMES FERRIER, Secretary.

[OFFICIAL NOTICE.]

February Meeting, New York Section, Illuminating Engineering Society.

The regular monthly meeting will be held on the evening of the the 17th inst., at the United Engineering Societies Building, 29 West 39th street, New York city.

A paper on School Room Lighting will be presented by Mr. Geo. W. Knight, Supervising Engineer, Board of Education, Newark, N. J., and Mr. Albert J. Marshall, Consulting Illuminating Engineer, New York city.

[OFFICIAL NOTICE.]

Annual Meeting, Illinois Gas Association.

ILLINOIS GAS ASSOCIATION,
OFFICE OF SECRETARY,
ELGIN, ILLS., Jan. 21, 1910.

To the Members, Illinois Gas Association: The next meeting of the Illinois Gas Association will be held at the La Salle Hotel, Chicago, Ills., March 15 and 16, 1910. A number of excellent papers have been prepared, and an enjoyable meeting is assured.

Yours truly, C. B. STROHN, Secretary.

[OFFICIAL NOTICE.]

Wrinkle Department, American Gas Institute.

WRINKLE DEPARTMENT, AMERICAN GAS INSTITUTE,
OFFICE OF EDITOR, ELECTRIC AND GAS BUILDING,
ATLANTA, GA., Jan. 10, 1910.

To the Members of the American Gas Institute: Please forward contributions for the Wrinkle Department to the above address. I would suggest that each manager address a letter of solicitation to the head of each department of his Company. Kindly assist me in this work I have undertaken, and greatly oblige, Very respectfully yours,

R. C. CONGDON, Editor.

[SPECIAL OFFICIAL NOTICE.]

Bureau of Information, American Gas Institute.

DETROIT CITY GAS COMPANY,
ENGINEERING DEPARTMENT,
DETROIT, MICH., Nov. 26th, 1909.

To the Members, American Gas Institute: Send questions to be submitted to the Bureau of Information for answer to V. F. Dewey, Chairman, Gas Office Building, Detroit, Mich. The Bureau of Information respectfully solicits your troubles. Yours respectfully,

V. F. DEWEY, Chairman.

BRIEFLY TOLD.

SALES IN BOSTON, MASS.—THE Boston Consolidated Gas Company continues to show large increases in output, the January figures missing the half-billion mark by less than 45 million. A large portion of this must be accredited to the lighting end, for although the matter of public lighting will remain unsettled until August 1st, the private end is showing good returns. The most handsome booklet recently issued on modern gas lighting shows a progressive spirit in many ways, for whoever had the making of it, certainly appreciated the value of gas in the residence end, perhaps the commercial lighting just naturally comes in.

THE NATIONAL COMMERCIAL GAS ASSOCIATION.—The success of the Gas Show has encouraged the commercial men to greater efforts than ever before. They are to have a permanent Secretary, Mr. Louis Stotz, formerly of the new business division of the United Gas Improvement Company, who has succeeded Mr. L. S. Bigelow, the latter being unable to properly care for the growing needs of the Association without interfering with his private business connections. Mr. Bigelow deserves great credit for his work, and his successor must needs be a veritable hustler to keep up the pace set. The new Secretary's headquarters are at 36 West 39th street, New York city, opposite the United Engineering Societies Building. The President has announced the following selections as Committee Chairman for the ensuing year:

Amendment to Constitution.—C. A. Learned, Meriden Gas Light Company, Meriden, Conn.

Coke, Tar and Other By-Products.—J. C. Brewster, National Coke and Coal Company, 230 Avenue C., New York city.

Commercial.—J. D. Shattuck, Chester, Pa.

Industrial Fuel.—A. V. Wainwright, 40 Wall street, New York city.

Local Sections.—C. W. Hare, U. G. I. Company, Philadelphia, Pa.

Exhibition.—R. C. Ware, Boston Consolidated Gas Co., Boston, Mass.

Gas Engines.—W. W. Cummings, Boston Consolidated Gas Co., Boston, Mass.

Illumination.—Norman Macbeth, Welsbach Company, Gloucester, N. J.

Membership.—P. S. Young, 763 Broad street, Newark, N. J.

Bulletin.—W. J. Clark, Mount Vernon, N. Y.

Papers.—C. N. Stannard, Denver Gas and Electric Co., Denver, Col.

Public Policy.—F. W. Frueauff, Denver Gas and Electric Co., Denver, Col.

Relations with Manufacturer.—H. B. McLean, 29 East 21st street, New York city.

Accounting and Relations with Customers.—W. H. Pettes, Public Service Corporation, Newark, N. J.

Finance.—A. V. Wainwright, 40 Wall street, New York city.

CURRENT MENTION.—

MR. J. R. STRAIN has resigned his position as New Business Manager for the Nashville (Tenn.) Gas Company, and will go to Lafayette, Ind., as Commercial Engineer for the Indiana Lighting Company, which controls the plants at Lafayette, Logansport, Fort Wayne and Peru, Ind.

MR. FRED. C. BUTLER, Superintendent of the Portsmouth (N. H.) Gas Company, has resigned to accept a similar position at Rochester, N. Y.

MR. MICHAEL J. FALLON, for over 20 years in the employ of the Louisville (Ky.) Gas Company, died at his home in Louisville on the 3d inst.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 10 cents.

947,914. Gas Cooking Device with Heat Regulator. H. Junkers, Aix-la-Chapelle, Germany.

948,045. Manufacture of Lime and Gas. G. G. Floyd, Kirkwood, Mo.

948,049. Foul Gas Valve. O. F. Greim, Milwaukee, Wis., assignor to the Milwaukee Coke and Gas Company, same place.

948,062. Gas Cleaning Apparatus. J. Morgan, Westmont Borough, Pa., assignor to Cambria Steel Company.

948,133. Gas Burning Attachment for Furnaces. F. J. Coyle, Kansas City, Mo.

948,249. Gas Producer. J. Reuleaux, Wilkinsburg, Pa., assignor to A. Laughlin, Sewickley, Pa.

Flexible Metal Hose for Gasholders.

The problem of overcoming the annoyance and vexations connected with the use of rubber hose for conveying steam to the cups of the gasholders is one of unusual importance in the operation of gas plants. The frequent replacement that is necessary when rubber hose is used for the purpose creates an extremely unsatisfactory condition of affairs, and one of the chief sources of trouble connected with the use of rubber hose lies in the gradual hardening of its inside coating, followed by the falling-off of the latter and subsequently the plugging of the siphon which the first cold snap will then freeze and completely obstruct. From this it will be seen that an efficient substitute is not only necessary from the standpoint of economy, but is needed as well from that of uninterrupted operation.

A substitute for rubber hose that is receiving much attention from the operators of gas plants is known as "Indestructene," flexible, copper, holder hose, the constructors of which are the American Metal Hose Company. This hose is made by spirally winding a continuous strip of copper, then covering it with an asbestos braiding, and in turn covering the latter with woven cotton. These covers absolutely prevent radiation or condensation of the steam. The outside, woven cotton braiding is treated with a weather-proof and rot-proof solution and is, therefore, unaffected by either the weather or by being immersed in the tank waters, at least so the constructors say. When used in long lengths a braiding of fine copper wire is placed between the copper hose and its asbestos covering and firmly attached to the couplings on the ends of the hose. The copper braiding acts as a support and entirely eliminates any possibility of the hose parting under its own weight. This hose is steam-tight, extremely flexible— more so, in fact, than rubber hose—and is not affected by either steam, oil or gas, any one of which exerts an exceedingly deteriorating influence upon rubber hose.

"Indestructene" hose is made in all lengths and diameters, the ½ inch and ¾ inch being the diameters usually employed for gasholders. Although its initial cost is higher than that of rubber hose, its ultimate cost, due to its long life, brings it far below that of rubber hose. This latter fact was strongly emphasized, in a paper read before the last convention of the Iowa District Gas Association, by Mr. W. J. Bertke, of Sioux City, Ia. At the point in Mr. Bertke's paper where he wrote of the disadvantages of rubber hose and of his experience with copper flexible hose, he stated that the latter eliminated all of the troubles usually accompanying the use of rubber hose, and that it lasted three times as long.

[Continued from Page 250.]

REPORT OF PROCEEDINGS, FOURTH ANNUAL MEETING, AMERICAN GAS INSTITUTE.

Held in the Hall of Elks, Detroit, Mich., October 20, 21 and 22, 1909.

Second Day—Morning Session, Oct. 21, 1909.—*Technical Session.*

The meeting of the Technical Section was called to order by Vice-President Gartley, at 9:45 A.M.

The Chairman announced that the first paper would be a contribution from the laboratory of Arthur D. Little, by Hervey J. Skinner. The latter said: The paper which I am about to present is the result of an investigation on the application of tar to roads, which was carried on in the Little Laboratory of Engineering Chemistry, Boston, and is entitled

TAR AS APPLIED TO THE SURFACE TREATMENT OF ROADS.

The problem of preserving the surface of roads and highways, and the prevention of dust, has been given attention by highway engineers for many years, but not until the year 1905 was the question seriously considered in the United States. The increasing use of automobiles and motor vehicles about this time introduced a new condition to be considered in the building and preservation of roads. Reports from various parts of the United States, England, France, and wherever the use of motor vehicles had become common, showed that the automobile was exerting an extremely destructive effect upon road surfaces.

The macadam road has especially been subjected to this destructive action, since it is the form of construction most commonly adopted for modern thoroughfares. The binder or fine material upon the surface of the road is removed by the constant passage of automobiles, thus exposing the larger stones, which become loose and which are either left on the surface or in windrows along the sides of the road. The roughened surface presents greater resistance to traction, and allows water to percolate to the foundation of the road, thereby seriously injuring the whole structure. Up to this time the macadam form of construction had been very satisfactory for the character of traffic for which it was designed, namely, that of iron-tired horse vehicles. In a perfectly constructed macadam road, the rock used is so adapted to the kind and amount of traffic that the fine material worn off from the rock replaces that which is removed by atmospheric agencies. Under ordinary conditions, it has been possible to maintain a hard and smooth surface at a moderate expense.

The advent of the automobile has changed very materially the character of the traffic. The action of the rubber tires is very different from that of iron tires and practically no dust is worn off to replace that removed by ordinary wear. The great tractive force or shear exerted by the driving wheels of motor vehicles is the main cause of this injurious effect. It has been demonstrated by a series of experiments in which separate speedometers were connected to the front and rear wheels of automobiles, that there is a very appreciable amount of slipping of the driving wheels on the surface of the road. This slipping effect throws into the air large quantities of the fine surface material, which is caught by the air currents generated by the car body and subsequently removed from the road by the wind.

Aside from the disintegrating action on the road, the dust raised by automobiles is a menace to health and a source of great discomfort to those living near much-traveled highways, especially in residential sections. Another consideration of importance is the damage to property, and instances are recorded where country estates have been disposed of far below their value, and farms and orchards abandoned owing to the dust nuisance. The increasing number of automobiles each year emphasizes their importance as a factor to be taken into consideration, and consequently highway engineers have given careful study to the necessity of making a change in the present practice of road construction, as well as evolving some method of preserving the surface of the enormous mileage of roads already built.

The increased cost of maintenance, resulting from these changed conditions, has resulted in a search for some method of surfacing other than that commonly used on macadam roads. Various materials have been proposed and used, some of which are temporary in their nature and are simply intended as dust preventives. Others are more permanent in character, and are advantageous in actually binding the surface of the road together, thus becoming an integral part of the structure. Of this latter class, crude oil and tar are the most important and numerous preparations of these materials have been used with varying degrees of success. Coal tar has been employed in road building for many years. Tar macadam roadways were constructed in Nottingham, England, as early as the year 1840, although under rather crude conditions. Coal tar pavements have been tried in various parts of the United States, but, as a rule, the results have not been satisfactory, asphalt being found superior as a paving material. In more recent years tar macadam roads have been quite successful, and this form of construction is now used to a considerable extent.

The application of tar to the surface of a completed macadam road, while comparatively new in this country, was tried in France about 40 years ago. The results were rather unsatisfactory, but the practice has been carried on to some extent at intervals since that time, especially in Italy and France.

In the United States the first experiment which attracted the attention of road engineers was in the summer of 1905, when a series of careful experiments were made at Jackson, Tenn., by the United States Office of Public Roads, in co-operation with the City Engineer of Jackson, to determine the value of coal tar in the treatment of broken stone roads. The widespread interest created by these experiments led to similar ones in various parts of the country, particularly in Massachusetts, Rhode Island, New York, New Jersey and Pennsylvania.

The variation in the methods of application and the lack of attention to the quality of the tar and the condition of the road, have led to a difference of opinion as to the real value of coal tar in surface treatment. The methods of applying the tar have varied considerably, but perhaps the one more generally used, especially in the earlier experiments, is to remove the dust and all loose particles by thoroughly sweeping the surface of the road and then applying the

tar from an open kettle, mounted on wheels, and fitted with a portable fire-box. The tar is brushed over and into the surface with stiff brooms, such as are ordinarily used for street work. The kettle is kept in advance of the workmen, and by using two kettles and heating one while the other is in use, the process is made continuous. After allowing the tar to soak into the surface, it is covered with a layer of sand or fine stone screenings. When several hours have elapsed the road is completed by rolling with an ordinary steam road roller.

In some places, particularly in Europe, mechanical means have been employed for applying tar. Some years ago the Road Improvement Association held in England a competitive trial, in which many of the machines were fitted with ingenious devices. Nearly all of them provided for heating the tar and applying it under pressure by means of compressed air. Some of them were designed for carrying on the whole operation with one passage of the vehicle. The dust and loose particles were first removed by suction and drawn up into a receiver. The tar was then applied by compressed air and spread over the surface of the road by means of automatic brushes. The fine material previously removed was again distributed over the surface and rolled by the steam heated wheels of the machine. Some of these machines were drawn by horses, and others, the larger ones especially, were self-propelled.

The method most commonly used at the present time is a compromise between strictly surface application and tar macadam construction. and is known as the penetration method. In this method the surface of the road is broken up by means of a scarifier, new material added to fill ruts or other depressions, and the road reshaped. After a slight rolling, without the addition of water, the tar is applied and allowed to stand as in the previous method. A dressing of fine material is then spread over the surface and the road well rolled, with the result that a surface is formed in which all of the spaces between the hard stone are filled with a minimum amount of tar. A road treated in this manner is similar to one built by the tar macadam process, in which the stone and tar are mixed before being laid.

Many of the trials which have been made with tar as a surfacing material have failed because of a lack of appreciation of a number of important details. The structure of the road, its condition at the time of treatment, the traffic to which it is subjected, the character and amount of tar used, are all important factors which are necessary for successful results.

The structure of macadam roads varies according as each engineer has deviated from the original method of macadam construction to meet his own ideas. As a rule, however, the formation of the road is much the same and is of minor importance in comparison with the actual condition of the surface at the time the tar is applied. The road should be dry and as free from moisture as possible, since water and tar are not miscible in any sense, and if the tar is applied to a wet road, the latter is, so-to-speak, tar-proof, and proper penetration is impossible. In such a case the peeling of the surface is very liable to result, owing to the tendency of the tar to remain on the surface as a crust. It is equally important that the road surface should contain as little dust or loose material as possible, as the latter will absorb the tar instead of allowing the tar to be absorbed by the road. This again results in the formation of a crust, which, under certain conditions, will peel off, leaving the exposed surface of the road comparatively free from tar.

The kind and amount of traffic to which different roads are subjected is very variable, and in cases where the traffic is particularly heavy or excessive, ruts and hollows are sure to exist. These irregularities in the surface make even rolling impossible, and unless repaired previous to tarring, water will collect in them and soon exert a detrimental effect upon the tarred surface. In many instances traffic has been allowed on the road too soon after treatment, and this alone has been the cause of a number of failures.

The character of the tar is of almost equal importance as the condition of the road. Tars vary widely in composition even when produced by the same process. The character of the coal used, the method of carbonization, the temperature of distillation, all have a decided influence on the composition of the tar. The value of coal tar in the surface treatment of roads depends almost entirely upon the binding power of its heavy bitumens. Besides these bitumens, there are present other substances, such as water, ammoniacal liquor, oily constituents, including the light oils and the creosote or "dead" oil, naphthaline, anthracene and similar compounds, and free carbon, the proportion of which varies according to the manner in which the distillation process has been carried out.

The presence of water in coal tar has a similar effect as moisture in the road. If a tar containing water is applied to a dry road the latter absorbs the water more readily than the tar, producing the tar-proof effect to which reference has already been made. Difficulty is also experienced in handling tar containing an appreciable amount of water, since the water causes foaming, and if the vessel is heated by direct fire the dangers of the tar going over the side of the vessel and taking fire are great.

Ammonia is another undesirable constituent, it being alkaline in nature and having a tendency to form, with the oily constituents, soluble compounds which are easily washed out by the action of the rain.

Naphthaline and anthracene, while they exert no particularly harmful effect, as in the cases of water and ammonia, have no binding power, and their presence simply reduces the amount of valuable bitumens which may be present.

Free carbon, like naphthaline, has no detrimental effect; but on the other hand, it is a useless constituent so far as road treatment is concerned, and its presence reduces the binding power and water-proofing effect, since it possesses none of these qualities itself. The oily constituents of coal tar are valuable to some extent since they act as diluents. The light oils are more or less volatile and are probably evaporated soon after the tar is applied to the road, but their presence makes the tar thinner and consequently renders their application easier. The creosote oils are also of some advantage, as it is claimed they add life to the tar and prevent it becoming too brittle.

The amount of tar is another important detail, and if more is applied than the road can properly absorb it will remain on the surface and be taken up by the top dressing, with the resulting formation of a crust. Another objection to an excessive amount of tar is that it has a tendency to become sticky in warm weather and slimy in wet weather.

Sand, or fine screenings, have been used as a top dressing in the majority of the trials with coal tar, although occasionally the fine material removed from the road previous to tarring has been used. Stone screenings are probably the best material to use on a macadam road, since they furnish a dressing of the same material as the road itself. A comparison of coal tar with other road binders and dust preventives is somewhat difficult in the absence of really comparative experiments. Some few trials have been made in which different materials were used on the same stretch of road, but in most cases those experiments using such materials have been on different sections of roadways, and consequently the results were not truly comparable.

Another cause for lack of comparative data lies in the great diversity of materials which have been used. As we have seen, the efficiency of a dust preventive is in proportion to its binding power and, therefore, a comparison of only those materials of approximately the same binding power is justifiable. The various dust preventives really form a series from water, which has no binding power, up to coal tar and the heavy asphaltic oils, which have the maximum binding power of any of the materials yet proposed. Water, salt solutions and light oil emulsions are of the nature of temporary binders and are not to be compared with the more permanent ones, such as coal tar and oils having an asphalt base.

The use of oil has been confined largely to the United States, and by far the greater portion of the work has been done in the West, owing to the proximity of the oil fields which supply oils with an asphalt base. In the Eastern portion of the United States the cost of transportation has been so great that comparatively little experimenting has been done with oil. Tar has been used quite extensively abroad, especially in England and France. In the United States its use has been confined very largely to the Eastern and Northern States, although the park authorities of the larger cities have used tar to quite an extent.

Experiments have pretty clearly demonstrated that coal tar is not adapted for the treatment of gravel or soft earth roads, owing to the fact that it does not amalgamate sufficiently well with these materials to bind them together. For roads of this class, therefore, oil has been more successful than coal tar. The use of coal tar has been and must be confined almost entirely to macadam or broken stone roads, and for roads of this nature it is probably more suitable than oil.

Oil, as a rule, has greater power of penetration than coal tar, but its value is dependent in a large measure on its asphalt base, and before its maximum binding power is reached the more volatile constituents of the oil must be allowed to evaporate. This evaporation is a slow process, and until it is complete the disagreeable odor of the

crude oil will be apparent and more or less objectionable. The use of oil has also received considerable criticism owing to the damaging effect which it has upon clothes, and the paint and varnish of vehicles, especially in damp weather, when a greasy, disagreeable mud is formed.

Coal tar, on the other hand, solidifies quite completely as soon as it is cold, and does not depend, except to a small degree, on the gradual evaporation of its volatile constituents for its hardening. It is comparatively free from the objection of being picked up and thrown by the wheels of vehicles, and although it has a decided odor, which lasts for a short time after application, this is not particularly objectionable, and to most people is much less offensive than that of crude oil. An objection is sometimes raised to the use of tar on account of a fine black dust which wears off the tarred surface. It is true that such a dust is formed, but the amount is insignificant in comparison with the dust which would have formed if the road had been untreated.

It is claimed that coal tar has a decided antiseptic value, but how much importance can be attached to this feature is questionable. It is reported that an investigation was carried on in France to determine the number of germs present in the atmosphere over a tarred and an untarred road in the same neighborhood, and the number over the latter was found to be considerably in excess of those over the tar treated section. Crude oil also possesses a similar antiseptic property, but to a very much less degree. A properly tarred road is similar to an asphalt pavement, although of a more resilient character. The stone is all bonded together by the tar into a smooth, firm surface, which can be swept and washed in much the same manner as an asphalt pavement.

The principal agencies which cause deterioration of tarred or oiled surfaces are heavy rain, frost and the decaying organic matter which accumulates on the surface of the road. So far as can be determined, one kind of road withstands the action of these agencies as well as the other.

Water gas tar is used in connection with coal tar, but not to any great extent by itself. It has a greater power of penetration and less of it is required, but it is not so lasting in character. It is really in a class by itself and occupies an intermediate position between the temporary and the permanent binders. In some cases, where a limited amount of money is available, or where, for climatic reasons, it is advisable to treat the road with the idea of its lasting only through one season, water gas tar should prove a valuable dust layer, and any extension of its use will undoubtedly be in this direction. The value of coal tar in the preservation of macadam roads, and as a dust preventive, is still unsettled. It is certain, however, that in the majority of cases the life of a treated road has been materially lengthened, and by applying tar the complete rebuilding of many roads at an enormous expense has been avoided. One great drawback in the standardization of tar treatment is the impossibility of securing a uniform supply of coal tar. Coal tar is purely a by-product, and the processes by which it is derived are never run with reference to the quality of tar produced, but solely to obtain maximum yields of gas or coke, as the case may be.

The impossibility, therefore, of manufacturing tar to meet definite requirements, makes it necessary to utilize the supply available, but in so doing a certain amount of selection can be exercised and changes made whereby some degree of uniformity is obtained. Some attempts have been made to control the quality of the tar, but with rather unsatisfactory results. The manufacture of special coal tar preparations was intended to provide a greater uniformity, but many of these are, in the opinion of those who have used them, very variable, and the success attending their use is not in proportion to the extra price paid for them.

Strictly surface treatment of an already existing road, even under the best conditions, can only be regarded as a temporary expedient, and its use will probably extend only in cases where, for financial or other reasons, the rebuilding of the road is not justified.

Partial reconstruction of the road, whereby the surface is loosened, reshaped and the coal tar applied before the rolling is done, is undoubtedly a method of considerable value and one which will find more general application in the future. Many highway engineers have predicted an entire change in the methods of road construction, but it is difficult to believe that the macadam method, which has been so universally and so successfully used for a long time, can be eliminated. It is more probable that some modification of the macadam form of construction will be adopted, in which event the tar macadam method is sure to be one of the first to receive serious consideration.

The Chairman - At the conclusion of the reading Mr. Price has some lantern slides which he will exhibit.

Discussion.

The Chairman—This is a most interesting subject. There are some gentlemen here I know who have their own ideas on tarring roads, and a good many of them have had experience in that work. In order to start the discussion, I will ask Mr. Fulweiler if he has anything to say.

Mr. Fulweiler—There are one or two questions I should like to ask Mr. Skinner in regard to his paper. I should like to ask him whether he does not think the black dust that has often been urged against the use of coal tar as a road surface treatment is not due to the excessive amount of free carbon with which the mixture is charged, and which is carried away by the traffic. Another point is the advantage of a machine to mix the materials. I might say that I saw the Government using a concrete mixer in New York last summer with very good results. Another mixer that I believe will give even better results is the Fulton mixer, which has double paddles and seems to give a good turning motion.

Mr. Skinner - I never had any experience with dust to determine whether there was free carbon in it, but I should doubt very much if there was. I should think it was probably the fine surface material that wears off, and I should doubt very much whether it had any relation to the amount of free carbon in the tar.

The Chairman—Mr. Waring, will you tell us some of your experiences?

Mr. Waring—We have had a very successful experience in Omaha. I will not take up your time to describe our methods in detail, but I do not believe there is any tar produced in any gas works that will not be beneficial to a roadway. Of course, the better the tar the better the results. We started at Omaha, as an educational method 4 years ago, to paint roadways, and now we have educated the people to wanting a permanent paving. A large amount of this is being done, and I have been personally very much interested in this disposition of tar, and think this is the greatest opportunity to find an outlet for all of our product. I think every gas man can do this work himself; it is missionary work which will help us all. As to the different qualities of tars, I think that we are not yet in a position to state just what these tars should contain; and, as tar is a by-product, I doubt very much whether we can get exactly the best without further expense in the operation of our plant. I do not agree, however, with Mr. Skinner when he speaks about water gas tar not being as good as coal tar, because I think water gas tar is better. I would like to know in what way it differs if brought to the same point of distillation. If it is not as good, he must have some data on that subject. We have been using water gas tar successfully in Omaha for 4 or 5 years and find it very satisfactory.

Mr. Skinner On what kind of roads?

Mr. Waring—All kinds of roads; we use it on dirt roads very successfully. We have a great many miles of dirt roads. They are rounded up and the tar is put on by a painting process. On cinder roads the tar is put on both by the painting and the penetration process. On macadam roads it is put on as described in the paper.

Mr. Skinner—I think most of the work in Massachusetts has been done on macadam roads, and in this case I think the coal tar is much more satisfactory than the water gas tar. On gravel or soft earth roads water gas tar, I believe, has been used very successfully.

Mr. Price—I should like to ask the previous speaker whether he takes any measures to get the odor from the water gas tar; whether he uses it crude or partially distilled? If so, how far he carries the distillation?

Mr. Waring—I think you will find that the odor in water gas tar will largely disappear when the light oil is distilled off. In the penetration system we bring the water gas tar down to the point where it has the same consistency as heavy coal tar.

The Chairman—Mr. Waring, you refer to the water gas tar, not as a tar as it comes from the separators or the tar well, but to a prepared water gas tar in which the water and some of the lighter oils have been distilled off. Is that correct?

Mr. Waring—We take the tar as it comes from the separators and we remove all of the water and the light oils that contain this offensive odor, and after this is done it is ready for the painting process, put on by a sprinkling wagon. If we want to use it for the penetration system, we carry the distillation still farther until it has the consistency of the coal tar that is used in the penetration system.

Mr. Blauvelt—I should like to ask the last gentleman the method

for binding this water gas tar to the dirt road. He paints them, he says. Is that to keep the frost out of the road, and does it prevent injury by traffic during the winter time? In other words, does it do auything more than make the road dustless in the summer?

Mr. Waring—We paint the dust roads. They are rolled up, and we paint them with a sprinkling wagon, 1 gallon to every 3 square yards. This is done in hot, dry weather, and it makes them not only dustless but weedless, and also it prevents mud. It puts a waterproof coating on, so that the water, instead of penetrating, runs off to either side of the road. As to the frost, the roads are in good condition in our climate all winter. We practically have no rain in Omaha from about the 1st of November until about the 1st of March, and very little snow; so that, while this practice may be beneficial in our climate, it may not be in other climates, where they have thawing and feeezing as they do south of the Ohio river.

Mr. Price—I should like to ask Mr. Waring if he thinks the character of the oil used in making water gas tar has anything to do with the quality of the water gas tar; whether he thinks an asphalt base is any improvement over a paraffine base?

Mr. Egner—I want to say something about this tarring of roads. I am not now connected with the Norfolk Gas Company, but I live in that city, and I notice that we have particularly good roads. The roadbed is treated with water gas tar, and it makes those roads, many miles of them, dustless and very comfortable to ride on.

Mr. W. A. Aldrich—With reference to this water gas tar, there seems to be some little misapprehension as to what it consists of. As to the mixture of water gas tar and coal gas tar, there is no difference, so far as application to macadamizing roads is concerned. The gentleman who replied to so many questions seemed to be misinformed as to what water gas tar really is. After you distill your water gas tar, as far as the odor is concerned, you can tell water gas tar from coal gas tar. Water gas tar is as useful and practical as coal gas tar. The mixture of water gas tar and coal gas tar makes the finest combination for a road that it is possible to make, if the proper care is exercised in the mixing. Some of our finest roads can be seen in Canada, and it is time that we gas men did something else than talk about tar for roads. I think we ought to go home and get into the tar business. I heard of a gas tank out in Washington with about 200,000 gallons of tar in it. They had nowhere else to put it. I think there is no doubt about it, gentlemen, that a tar macadam road, made with a tar well distilled, well mixed with the macadam, and rolled properly, will make a better roadbed than any asphalt that was ever laid upon the street.

Mr. E. C. Jones—I was not going to speak on this subject, because California is so far removed from the East, and its interests are so different, but out in California we are automobile mad. We have in that State, with a small population, over 27,000 automobiles, and we have, extending from the north to the south of California, what has always been known as the King's Highway. We are endeavoring to improve our roads to keep up with the growth of the automobile business. In coal gas tar we have phenol; there is none in water gas tar. I believe no man in an automobile going at the usual rate of speed can tell whether it is coal gas tar or oil gas tar used in making the road. In California we have a natural product known as bituminous rock, it consists of 80 per cent. of sand and 20 per cent. of infiltrated oil. We used that many years on our sand foundation for road making, and it proved very unsatisfactory. The natural mixture of oil and sand is not nearly so satisfactory as the artificial mixture. We are now using asphaltum on the city streets, but our California petroleum, with an asphalt base, for country road making. We found that we have to plow our roads. We plow them to a depth of a foot and we sprinkle with oil in large quantities. The oil is kneaded into the road by large rollers covered by teeth, so that we have the original macadam surface thoroughly mixed with asphaltum. The sun evaporates the volatile parts of this oil to a certain depth, leaving the asphaltum base firmly mixed with this original roadbed, giving us a road which will stand up for a long time under the terrific wear of automobiles. In answer to the question about fixed carbon on roads, I do not believe any analytical action takes place on a road surface.

The Chairman—Mr. Jones, what quantity of oil do you use per square yard?

Mr. Jones—It varies considerably, depending upon the original construction of the road; it runs as high, I should say, as a gallon and a half to the square yard, for merely surfacing, up to, I should say 4 or 5 gallons where the road is plowed down. We are making roads last a long time in California.

Mr. Rice—There has been quite a little said about education, but I haven't heard anybody tell us how we are going to educate. It seems to me that the only way is to educate the people that are running the towns, townships and counties, by going out and building a little stretch of road for them and showing them. That is what we are doing. We have just finished a couple of blocks in Joliet of tar macadam, and donated to the city the tar, the engineering, and the labor of putting on the tar, to show them that tar macadam is the thing. In the West they don't know what it is, and, on account of the proximity of the oil fields, they are mostly putting on oil, which is very unsatisfactory to everybody but the people who have the contract for putting it on. I noticed in a Chicago paper the day before I came away that out in Oak Park a lady made a complaint to the town authorities that her carpets had been ruined by the oil. It seems that an automobile had blown up a tire in front of her house and the man came into her house to use the telephone. He dragged the oil all over the lady's carpets, said, "thank you," and departed. That is what oil does. We must go to work and persuade the people out there to stop using oil, and use tar instead, and the only way to do this is to use the same commercial methods in this tar macadam business that we use in the matter of our appliances, etc.

The Chairman—This subject of tarred roads is one of many in connection with roads that are occupying the attention of the people. We must have better roads, because we require higher speed. There is no doubt that a great many roads are very badly tarred at the present time. I recall a case in which it appears that a man, who was a hotel proprietor, had evidently read somewhere that tar was good for roads, bought some tar and put it over a road that had dust on it about 2 inches deep. The wagon of this man, and probably of a good many others, acted on the road with a spinning wheel effect, and the tar was thrown all over the wagon, horse and the harness. We must come to a better understanding of what we need. If it is a bitumen that we need, if the binding quality is found in the bitumens, we must use those oils or tars probably that have the most bitumen in them. How to test the tar for use on roads is a question, but the Office of Public Roads, in Washington, have written a good deal on the subject, and are very much interested. The Government and the States also have discovered that the value of farms and property generally along good roads is enormously increased, so that it pays very well to do it. I think, Mr. Jones, that the State of California has found that money spent on roads is a most excellent investment.

Mr. Jones—The State of California this year has appropriated $18,000,000 for road improvements.

The Chairman—Is there anything further that anyone wishes to say on the subject?

Dr. Elliott—Mr. President, I have listened with a great deal of satisfaction to this discussion. I had the good fortune this summer to be in the south of England where they have a number of these roads. I have had nothing to do with road making, I do not know any thing about it, but I noticed one or two things that I think extremely interesting. I had the good fortune to meet Mr. Maybury, the County Surveyor of Kent, and I travelled over about 120 miles of roads that he had fixed. The way he fixes the roads is extremely simple. First of all he takes a macadamized road and repairs it, rolling it well. Then he takes a large kettle of tar, and it is immaterial to him, apparently, whether it is water gas tar or coal gas tar, for he uses both indiscriminately. But I think he said he preferred water gas tar, provided that the volatile matter and water were properly taken out of it. The machine that I saw him using, and that made a splendid road, was one that I suppose would hold about 100 gallons of tar, kept hot by a coke fire and put upon the roads at a temperature of about 185° F. by the thermometer. The tar was put on the road with a pump at probably 20 to 30 pounds pressure. The tar was spread upon the road approximately ½ of an inch thick, and then a cart followed immediately after with sand and spread the sand evenly all over the road. He told me that that road was good for 2 years. I think this is a very simple method. They certainly make good roads in this way in the south of England. You must remember, however, that the south of England is a chalk country; their roads are chalk roads and they are pretty good roads to start with, but they get into ruts from the automobile traffic. I expect to learn more about it, because I am promised some of his reports. I want to testify to the simplicity of the operation as he does it and the good results that follow. They are beyond question.

Mr. Price—I should like to say, in connection with the English treatment of roads, that two members of the Massachusetts Highway Commission went abroad to the Paris Good Roads Convention. They

also went all through England on a road hunt, and they saw the machines, the method of application and everything that could be seen in connection with the methods now in use in England. They purchased two machines similar to those used in England at a cost of $4,500. They brought them back to this country, but they have had them all this season and have not yet tried the British methods, for what reasons I have never asked, but I doubt very much whether the English method of making these roads would survive a season in this country. They put on ½ of a gallon per square yard, and with the roads in this country it is hard work to make them stand up a season with less than ½ a gallon. In connection with this tar question it would perhaps interest the gentlemen here to know the extent to which it is being used in New England. They are building tar macadam roads now in 6 or 7 cities in Maine; Lewiston, Westbrook, Hallowell, and a number of other cities and towns under the direction of the State Highway Commissioners. In Massachusetts they are letting several contracts amounting to 60,000 gallons on one road. At Providence, R. I., the contractor gets his tar from the gas works in barrels; he finds it more economical to own his own barrels, having over 1,000. The State of Maryland is about to let one contract for 180,000 gallons of tar for one single stretch of road 8 miles in length. This shows how much tar they will use if they once get started.

Mr. Andrews—As to tar macadam pavements, we put down a great many miles of such pavements. We have found from long experience that one feature is absolutely necessary in all roads of that character, namely, a good foundation. Too much stress cannot be laid on this point, and, under the latest specifications, we are now putting in rock concrete foundation, as we would for asphalt pavements. We found in that way that the cost is increased less than 50 cents a yard and we get a foundation that will last indefinitely. If the tar macadam wears out it is simply a matter of replacing 2 or 3 inches instead of digging down to get a good foundation again. We had one case where for the foundation, the ground under the street having a very poor bottom, the contractor rolled in rock until he had 8 or 9 inches. Before he got through with the job it began to show signs of rolling, and in two years the street was practically a wreck. Such work gives the whole tar macadam proposition a black eye, and it could have been saved by the expenditure of a very little additional care and money. I cannot urge too strongly on all going into this treatment of roads to insist on a good foundation first. Mr. Jones, I think, has found the same thing in California, that it is absolutely necessary to get a foundation or you will find the road will very soon break up.

The Chairman—Gentlemen, we will have to close this discussion of a very interesting subject. The next paper is by Mr. Charles D. Lamson.

A DESCRIPTION OF A RETORT HOUSE.

Mr. Lamson—Mr. President and Gentlemen: The paper which I propose to read you was the result of a series of experiments which have been tried at Worcester, Mass., during the last year. It was read before the Society of Gas Lighting, and the Technical Committee of this Association asked me to read the paper here.

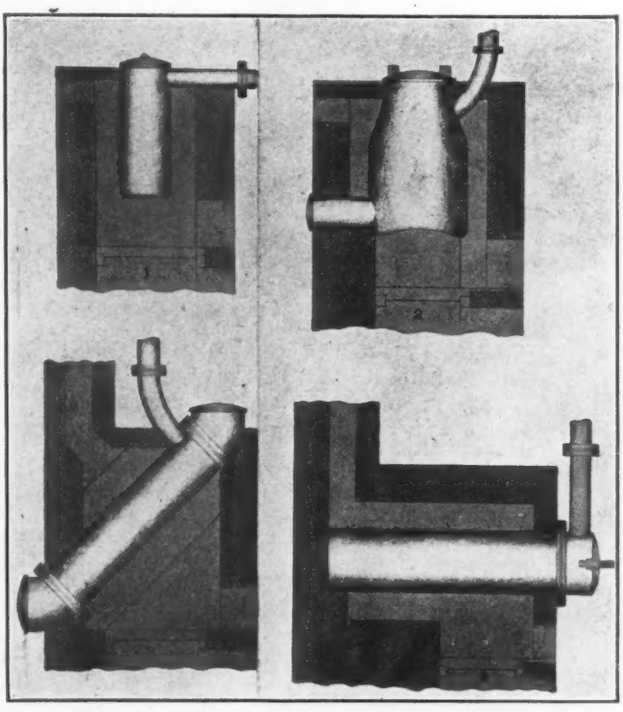
I have decided to give this paper the title of *A Pound of Coal* rather than "A Description of a Retort House."

While our new retort house has enabled us to obtain the remarkable results here recorded, other engineers in different parts of this country hand in Europe are developing many new ideas in the way of retort houses, retort stacks and machinery for the production of coal gas, obtaining many most excellent results. I do not wish to criticise them or make any claim for our retort house as compared with them, I wish to make a simple statement of the house and apparatus, and give some of the results we have obtained in practical working—results which almost from the start have increased my respect for the pound of coal, and have led me to wonder and regret that we gas engineers have so long been contented, even in these later days, when the study of economies is so much in vogue on every hand, with 3¾ to 5 feet per pound of 14 to 14½-candle gas, when 5.90 to 6 feet of 16 to 17-candle gas can be obtained from the same pound of coal. In other words, contented with 75 to 80-candle feet when 95 to 100-candle feet, possibly even more, not only may be, but *is daily* obtained in the new retort house in Worcester.

Let us use the title "A Pound of Coal" and see what we can obtain from it in horizontal retorts. Although I noticed in a recent number of a prominent Gas Journal the following statement: "A prominent gas engineer stated that, in view of the recent results obtained in vertical retorts, he thought it a waste of time to discuss horizontal retorts in any shape, with or without machinery, for large, medium or small works, and the sooner all concerned wake up to these facts, the better for these companies and their stockholders."

Clegg, in his treatise on the "Manufacture of Coal Gas," writes as follows: "The birthplace of gas lighting was Redruth, in Cornwall, and the sole merit of its invention—the practical application of coal gas to the purpose of artificial illumination—is due to Mr. William Murdoch. The exact period at which that gentleman began his experiments on the distillation of peat, wood, coal and other inflammable substances, is not known. In 1792 we find him manufacturing gas with an apparatus of his own construction and lighting his house and offices."

In 1798 gas light might be said to have been first used as a commercial and economical substitute for lamps and candles. Mr. Murdoch was at work on various simple forms of retorts for the generation of gas from coal. The following sketches are some of the first retorts used by Murdoch.

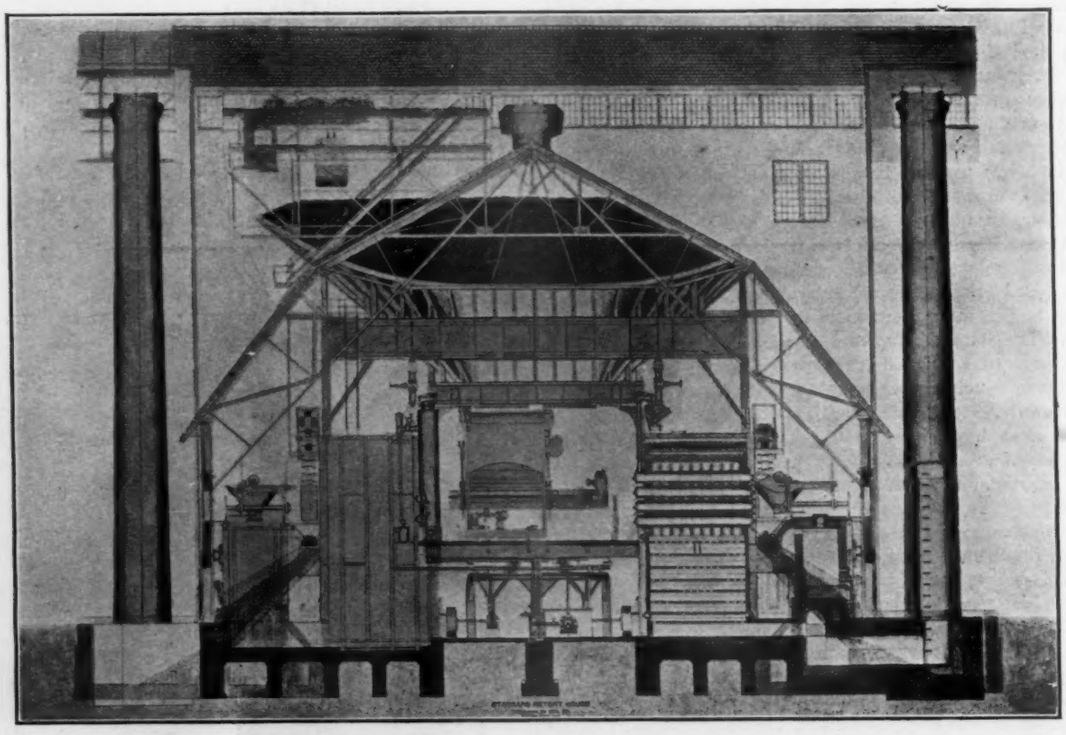


The first and second are vertical, the third "inclined" and the fourth horizontal; the last, horizontal, position of the retort for use in the distillation of coal was to continue in favor for many years. Built of many kinds of material, of many shapes and sizes, the horizontal retorts have been in general use the world over. In these later days, various forms and shapes of retorts, set in different positions, have come into favor with some engineers. But the horizontal retort still has its very strong advocates, and in this paper ("A Pound of Coal") I shall tell of it as carbonized in a stack of horizontal retorts unique in shape, construction and manipulation, but still *horizontal*.

Ever since the early history of gas making coal has played a most important part in the manufacture and distribution of illuminating gas for cities and towns. In fact, for many years it was the only material from which gas could be obtained in considerable quantities.

With the discovery of petroleum oil, a new and very important factor was introduced. Apparatus for the manufacture of "water gas" became a strong rival in competition with the retort house and coal gas machinery. There was a time, several years ago, when coal was put somewhat in the shade by its later rival. But during recent years, coal gas, because of improved methods of carbonization, has again come into general favor with engineers, and our "Pound of Coal" still holds its high place in producing illuminating gas. Now if we can only get what there is in the coal out of it, and utilize it, it will become again the king among materials for gas manufacture. It seems strange that in the first 50 years since the practical use of gas in coal by Mr. Murdoch, in 1798, so little advance has been made in the art of the manufacture of gas for illuminating purposes.

I think gas was first used in Boston in 1831. I, myself, went to the Boston works in 1872. The make of gas could not at that time have reached much more than an average make of 4 feet per pound of coal. For a long time after that the yield probably did not reach 4½ feet.



In the early days of my connection with the gas business, at the works of the Boston Gas Light Company, the retorts were nearly all made of iron, made with a small flue on each side of the bottom. The flue ran about ⅔ of the way back in the retorts. The settings were 3 retorts in one arch, and were heated with a small narrow furnace. Very good gas was made. The yield per pound of coal was small. The heat of the retorts "cherry red." For some years before this date, clay retorts, of moderate section and lengths, were in use in various works, and Boston was beginning to experiment with them. With the advent of clay retorts, higher heats were carried, and the number of retorts in an arch was rapidly increased. It was some years, however, before the furnaces were materially increased, and the half depth and full-depth furnaces with recuperation became general. There was a steady improvement in the design of retort stacks and, during the last 20 years, the advance has been very great all apparatus that pertains to a retort house.

The increase in the gas producing capacity of retort houses has largely come about from the possibility of handling larger amounts of coal to a retort and furnace. In the earlier days of my experience, 4½ feet of gas per pound of coal was considered very good for a month's working. There was a time when the New England engineers became stirred up as to the yield from coal, one vieing with another to reach the highest result. Some years ago, at the request of the New Englaud Association of Gas Engineers, I wrote a short paper for the entertainment of the members, entitled "A Cubic Foot of Gas." In starting to write about "A Pound of Coal" I am reminded of the "Cubic Foot of Gas." In referring to it I find on page 6 the following:

"Well, the race was indeed hot Neal shook his figures at Slater; Sherman his at Neal. Harbison was not far behind, indeed, I think he claimed to be ahead, 5.10, 5.25, 5.30. Then came the dark horse, Gerould, 5.57, 6.00, 6.10 and – but there the figures, even now as they come to my mind, cause a shiver of anxiety as I recollect the stopped standpipes, the plugged hydraulic mains, underground pipes solid, etc., etc." It is strange, but true, that these men were on the verge of certain facts that might, if proper apparatus had been offered them, have resulted in a very great advance in the industry of gas manufacture. But the resulting troubles from their high heats, pitch, tar, stoppages, choked standpipes and mains, as well as the rapid destruction of retorts and settings, soon induced more moderate running, and engineers seem very generally to have settled down to a make of 4.85 to 5 cubic feet of gas per pound of coal and a longer duration of retorts.

In the purchase of coal it is generally required that said coal shall yield 4.90 to 5 cubic feet of gas to the pound, of at least 15-candle gas, and while plenty of coal men would claim this or even more for their product, we all know that coal which would produce these results, or even a candle less, in continuous work, has been very hard to find. In the Worcester Gas Works, for the past 8 or 10 years, we have had good retort stacks with half-depth furnaces. Clay retorts 16 inches by 26 inches, 10 feet long. The results from these stacks, when in good order, have averaged 4.90 to 5 cubic feet to the pound, of 14 to 14½-candle power gas. There were times when the results were a little better and times when they were not as good. The coke has been good, and the tar fairly good. I think I am justified in saying that this has been considered generally a fairly good average result.

It is in consideration of these facts that I am led to write this statement of the results we have obtained in the new retort house that we have built at our works during the past 3 years.

In our old retort house the "Pound of Coal" gave, say, 4.95 cubic feet of 14-candle power gas, practically 70-candle feet.

In the new retort house the "Pound of Coal" gives 5.95 cubic feet of 17-candle power, practically 101-candle feet.

Coal.

As we have used Westmoreland coal almost exclusively in our Worcester works, I decided to use this coal in all my experiments.

It has seemed to me best to use only one standard coal of well known value and thus avoid any comparison of coals mined by various companies. During the past few years I have been able to receive all my coal "all rail." It is never disturbed after it is put into cars at the mines until it is lifted from the cars in our storage house by a large grab bucket. The bucket, in depositing its coal, is lowered to the top of the pile and the coal if allowed to slip out. It is never dropped, and, therefore, it is laid down in the coal shed in as nearly as possible the same condition as when put into the cars at the mines. It is not again disturbed until it is put into the crusher on its way to the coal bunker in the retort house I thoroughly believe in keeping gas coal as dry as possible and in as large lumps as possible until the time of using.

Over 3 years ago I began to consider building a new coal gas plant at the Worcester works. I visited very many of the larger and newer works in this country, and spent some time abroad in looking into

the better and more modern forms of retort houses in use there. I made a very careful study of the various forms of horizontal retorts and settings, charged by hand and charged by machinery; also a great variety o f inclined retort installations.

I have carefully examined vertical retort plants, both in England and in Germany. I have always been somewhat prejudiced in favor of horizontal retorts, and my investigations have not altered my preference for them. The new retort house at the plant of the Lowell (Mass.) Gas Light Company seemed to me to have some excellent features, and, in fact, I liked this house better in many ways than any other I had seen. The retorts are horizontal. They are of moderate length. They are operated from one end. The machine puts in the coal and pushes out the coke all in one operation. From the time I first saw the house I was very much impressed with it, and I decided that the house, with careful working, would produce excellent results. I understand that the results obtained in actual practice have been very satisfactory. One limit, however, to this house, as in many others, has been due to the firebrick material in the retorts and settings. That is, the limit of heat which may be used with safety to the firebrick material very materially curtails the capacity of the stack.

I decided early in my own mind that the general plan of retorts and methods of charging in use in the Lowell house should be adopted in my own retort house when I should build. The Lowell house was built by the Riter-Conley Manufacturing Company, of Pittsburgh, Pa. They had done a good deal of work for us and it had all proved satisfactory. I therefore asked them to make me a proposition for a retort house for our works. It was agreed that the general design of the stack used in the Lowell house should be adopted, but it was also agreed that the retorts should be longer—that is, 15 feet in length instead of 13—as in the Lowell house. It was proposed to use a new fire material in this stack—"Ricon"—which will be spoken of later.

The contract for the house was made in October, 1906. It was agreed that the house should be ready to make gas on the 1st day of October, 1908. The work was carried on quietly and satisfactorily in every way, and it gives me great pleasure to state that the first gas was made as agreed on the 1st day of October, 1908.

The general form of the retort house is entirely the idea of the Riter-Conley Company. It is novel, different from anything we have seen heretofore, and has worked out exceedingly well in practice. The house is designed for 2 retort stacks of 10 benches each, one stack on each side of the house. Only one stack is built at the present time.

The ground on which the house is built being somewhat uncertain, piles were driven for the whole structure. Upon these piles there is a very heavy concrete foundation. The house is built of structural steel. Along each side of the lower story are placed the large pressed steel doors, two in front of each pair of producers. The main columns of the steel frame are incased in concrete, thus forming pillars between each set of two doors. The second story of the house is of brick, built into the ironwork. Above this the structure is concrete and expanded metal on the iron frame. The roof is covered with tile.

The building is exceedingly well lighted. There are large windows of glass tile in the roof. A line of windows 5 feet high extends entirely around the house. These windows are easily epened and shut as required. A series of large, low doors on the working floor level, and a set of large ventilators in the roof, all tend to give most excellent ventilation in the house.

There is a large coal bunker in the roof space, capacity 600 tons. This coal bunker is filled from the coal storage house by means of a man trolley and large grab bucket (Brown Hoist) which passes over a covered bridge from coal storage house. The coal has been carefully broken to small size, the largest lumps not larger than 1¼-inch cube, double tracks for changing machines run through the center of the house. In the middle of these tracks, immediately beneath the coal bunker, is arranged a very efficient turntable, operated by electricity, with a large platform scale built into the same. The working of this combined turntable and scale is exceedingly satisfactory.

The stack of retorts consists of 10 benches of 8 retorts each. The retorts are 15 feet long, open at both ends. The retorts are "D" shaped, 16 inches by 26 inches. They are block, or sectional retorts of "Ricon" material.

There are duplicate charging machines. These machines are fitted with two parallel scoops of peculiar design. The machine has a pocket of 20,000 pounds of coal capacity. Coal is drawn from the overhead bin by easily handled valves. From this machine pocket the coal is drawn into the scoops for a charge of 900 to 950 pounds, as desired. The machines are worked entirely by electric automatic machinery. As the scoops, loaded with coal, are pushed into the retort, the coke of the former charge is pushed out. The scoops turn over and are withdrawn, leaving the charge very evenly distributed over the floor of the retort, also leaving it quite full. When the coal is heated, the space for the passage of gas above the coal is quite small. (See photograph showing the hot coke in the retort when charge is only half pushed out.) The time taken to charge and discharge a retort is very small.

Coke Conveyor.

When the coke is pushed from the retort, it drops on the conveyor and is carried out of the house. No quenching is done in the house. The conveyor can be easily understood by reference to the various photographs. It is exceedingly simple in form and of very few parts. It practically carries the coke and does not draw or push it. The result is that almost no "breeze" is made. The hot coke is deposited in an iron pocket outside of the house and is then quenched with water from hose. After being thoroughly drained and dried, it is taken out by a large grab bucket arrangement which will be understood by reference to the various plates. The general design of the ironwork of the stack can be plainly seen from the photographs.

Since my early connection with the gas business, I have always wanted to try some form of producer operated somewhat after Siemen's plan, that is, having the producer detached and apart from the retort stack, making gas and sending it forward into the benches to unite with air in combustion under the retort settings. The plans for the retort stacks in this house embodied this principle and I was very glad to adopt it.

There are two producers for each bench. They have large grate area and a depth of 7 feet and 3 inches of fuel. The producers are at the back of the stack and 7 feet away from it. The fuel is coke, but any other form of cheap fuel may be used. The producers are furnished with rocking grates kept in slow motion by an electric motor. A portion of the gases from the main flue of the retort stack are returned underneath the grate bars of producers. We have been running these bencnes steadily for a period of 11 months, and so far the producers have never been opened to clinker them.

Most of the waste from these fires is in the form of a fine, brownish-yellow dust. A very small amount of partially burned coke drops through the moving grates. This is screened out and returned as fuel. Once in 24 hours, the doors underneath the grate bars are opened and the fine dust is removed with a hoe.

The gases from these producers are carried through proper ducts into the retort bench, underneath the retorts, there uniting with the regulated amount of heated secondary air.

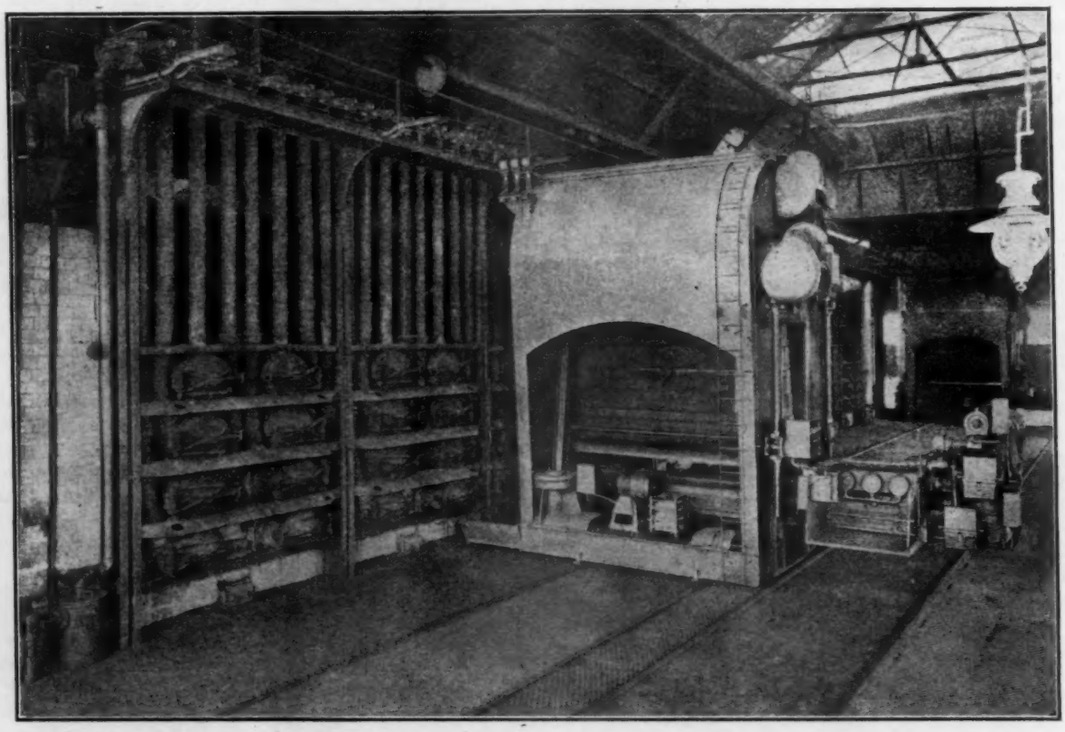
In recent years, to obtain large capacity with any one of the new forms of retort stacks, it has been considered necessary to have fairly large retorts, carrying large charges of coal. To work off the gas from these charges, it has been necessary to carry high heats. Some furnaces have been constructed which would produce the necessary heat, but it has been more or less difficult to control the same in such a manner as would insure an even distribution throughout the whole setting and about the retorts. Further, it has been exceedingly difficult to obtain firebrick material that would stand the extremely high heats for any length of service.

The "Stettin" foreign material is generally thought to withstand more heat than any other, although within a few years there have been several makers in this country who have manufactured material that will stand very nearly, if not quite, the same tests as the "Stettin" stock. I understand that the "Stettin" manufacturers instruct the users of their material that they must not carry a heat of over 2,500° F., and at that temperature they must be very careful of retorts and settings.

The contractors, in their plans for our house, proposed to use a new fire material—"Ricon." They at first proposed that they must not carry a heat of over 2,500° F., but later they notified me that I might, if I cared to do so, carry the heat several hundred degrees higher than this without fear of damaging the settings.

Having arranged for a liberal supply of the best gas coal, delivered into our storage house in best possible condition, and having established a thoroughly equipped retort house with best possible apparatus for working the same, I think we may feel that we are well fitted for the problem we have before us—that of obtaining the best results from the carbonization of our *Pound of Coal*.

The figures which I shall show you are from a period of 11 months practical working. It has really been a long series of interesting experiments. It has also been a period of hard work for everybody, and I therefore wish in this paper to give everyone his due meed of praise.



The contractors have from the first made every effort, sparing neither labor nor expense, to make the house a perfect whole. It has not been at any time a question of whether this or that change or improvement was something they could be called upon to do. It has always been, "Will it make the house better or more perfect in its working?" Our own people also deserve our sincere thanks, our Superintendent, Mr. Barnum, who has been untiring in his study and prosecution of the work, and who, with his technical and chemical knowledge, has worked out the heating problem of the stack so carefully. Our other people, assistants, foremen, chemists—even the workmen throughout the house it seems to me, have been unusually faithful, and actuated by a desire to do their best to obtain for me the very best possible results from the "Pound of Coal."

Most of the time we have been running 7 benches of 8's, or 56 retorts. The yield is from 5.90 to 6 feet of gas per pound, or 17-candle power gas, or over 100-candle feet.

Coke.

The coke from this stack is unusual. It is clean, clear and hard—more like "oven coke" than any I have ever seen. We make practically no fine coke for several reasons. First: The coke is very strong, hard and dense. Then the "coke conveyor" is of such a design that it makes practically no breeze. Our method of quenching and drying also helps to this end.

Proof.

In the working of our former retort houses we made a large amount of breeze. In practice we used this as fuel underneath our steam boilers, and still much was left over, so that when we started our new retort house we had a very large amount of breeze stacked in our yards. After this new house was started this pile of breeze soon disappeared and we were obliged to purchase a regular supply of slack coal for our boilers.

Tar.

The tar from this stack, as it has been running for the past 6 or 8 months (7-hour charges) has been very satisfactory. This tar is clear and limpid and easily cared for in all our hydraulic mains, pipes overhead, underground, drips, etc. The make of tar per ton of coal carbonized is practically between 13 and 14 gallons.

The Riter-Conley Company, in their contract for this retort house, agreed to run the retort stacks in practice during the first 2 months. They proposed to charge the retorts with 800 pounds of coal every 5 hours, at a yield of 5 feet of gas per pound of coal, producing 20,000 feet to the retort, or 160,000 feet to the bench in 24 hours. They very soon not only reached this capacity, but far exceeded it. The producers seemed capable of generating any amount of heat that was required, with ease, and the recuperation was perfect. Feeling confident in the durability of their Ricon material, they looked forward to reaching very much higher results. They produced at one time as high as 187,000 cubic feet of gas, per bench and hoped to be able to reach 200,000 cubic feet in 24 hours. But there were attendant troubles. Everything in the coal was turned into gas. There were no oils or thin tar in the gas to lubricate it on its way through the works apparatus. The standpipes, hydraulic mains, gas mains and drips gave much trouble. We were running, I think, with a temperature in the settings of 2,850° F. There was no longer any question of the stack as a *gas producer*, but to me, less gas and a quieter method of running was more agreeable.

When we took possession of the stack, we tried many experiments with different methods of running and finally settled down to 7 hour charges, with from 900 to 950 pounds of coal per retort. This, of course, reduced the yield per bench, but we were compensated for this loss by other advantages. My "Pound of Coal" was induced to give up very nearly the full value of the stock of gas contained in it, and that gas was of very excellent quality. The tar behaves itself in a very satisfactory manner and flows through the pipes and apparatus as it should. The ammonia results are very much improved and we hope eventually to get a large yield. The average heat in the settings at the present time is 2,450°. The average heat inside the retorts is 2,000°—see tables in Summary, next issue. The evenness of the heat throughout the settings is remarkable. It must be seen to be fully appreciated.

I have thus given a statement of the house, and its practical working for a period of 11 months. During this period, we have tried many tests of every kind. This work has been done by our own chemists and by experts from Boston and also from New York. We have tried to prove our figures before making any statements. I will, at the close of the paper, add some tables which you can consider and work over at your leisure.

The paper is not to be considered as a final statement, as I have said before. We have carried on many experiments and are constantly developing new results. We will, therefore, call the paper a "report of progress." I feel that I have demonstrated what I set out to do—*i. e.*, proved that there is much more value in the *pound of coal* than any of us have given it credit for. I hope others will continue on these same lines of work and add to the results.

(To be Continued.)

[Official Report—Continued from Page 250.]

SECOND ANNUAL MEETING, INDIANA GAS ASSOCIATION.

Held in the Claypool Hotel, Indianapolis, Jan. 19-20, 1910.

First Day—Morning Session.

The President—The first business in order is the

ROLL CALL.

Active.

Atkinson, G. G., Goshen, Ind.
Baker, W. M., Lafayette, Ind.
Barnes, D. A., Columbus, Ind.
Beers, D., Fort Wayne, Ind.
Bippus, J. F., Huntington, Ind.
Blank, C., Martinsville, Ind.
Blinn, A. C., Evansville, Ind.
Booth, W. F., Hammond, Ind.
Burke, E. J., Indianapolis, Ind.
Campbell, J. J., Kendallville, Ind.
Carroll, J. A., Logansport, Ind.
Case, H. M., Connersville, Ind.
Cooke, A. S., Terre Haute, Ind.
Crighton, D. K., Chicago, Ills.
Dales, J. S., Franklin, Ind.
Danforth, B. H., Fort Wayne, Ind.
Davis, A. B., Indianapolis, Ind.
Dick, F., Jeffersonville, Ind.
Dick, J., New Albany, Ind.
Dickerson, J. N., Crawfordsville, Ind.
Dolley, G. M., Peru, Ind.
Donovan, E. L., Logansport, Ind.
Dunbar, G. L., Auburn, Ind.
Dunbar, J.W., New Albany, Ind.
Dykeman, J. H., Evansville, Ind.
Eves, P., Indianapolis, Ind.
Forrest, J. D., Indianapolis, Ind.
Fox, C. W., Michigan City, Ind.
Frazee, W. M., Rushville, Ind.
Freese, F. W., Fort Wayne, Ind.
Gaddis, G. M., Shelbyville, Ind.
Geist, C. H., Hammond, Ind.
Graf, C. H., Indianapolis, Ind.
Griffin, J. F., Vincennes, Ind.
Guldlin, O.W., Fort Wayne, Ind.
Hayden, H. D., Valparaiso, Ind.
Heath, C. R., Noblesville, Ind.
Insull, N. J., New Albany, Ind.
Kellar, C. M., Columbus, Ind.
Kelsey, C. B., Grand Rapids, Mich.
Kelso, C. D., New Albany, Ind.
Kennedy, J., Garrett, Ind.
Kunz, G., Lawrenceburg, Ind.
Lane, F. K., Detroit, Mich.
Lloyd, A. G., Adrian, Mich.
Loomis, F. M., Indianapolis, Ind.
MacDonald, W. B., Evansville, Ind.
McLeod, A.A., South Bend, Ind.
Miller, C., Indianapolis, Ind.
Miller, J. H., Princeton, Ind.
Moncrieff, J. N., Bloomington, Ind.
Mulholland, S. E., Ft. Wayne, Ind.
Murdock, S. T., Lafayette, Ind.
Olds, H. L., Detroit, Mich.
Olsen, E., Indianapolis, Ind.
Ott, J. M., Rochester, Ind.
Perkins, J. A., Richmond, Ind.
Pickens, A. G., South Bend, Ind.
Ray, P., Albion, Mich.
Ridenour, O., Peru, Ind.
Riley, H. S., Indianapolis, Ind.
Rochat, H., Indianapolis, Ind.
Rowland, S. C., Crawfordsville, Ind.
Ruger, C. E., Muncie, Ind.
Stunkard, O. J., Brazil, Ind.
Summers, G., Indianapolis, Ind.
Symms, A., Linton, Ind.
Thwing, O. O., Ft. Wayne, Ind.
Travers, P. T., Indianapolis, Ind.
Waite, R. W., New Albany, Ind.
Wakeman, E.A., Terre Haute, Ind.
Wallace, W., Lafayette, Ind.
Walters, B. S., South Bend, Ind.
Witherby, E. E., New York City.
Wishart, T., Lafayette, Ind.

Associate.

Asendorf, C. F., Chicago, Ills.
Bestor, F. C., Minneapolis, Minn.
Bolds, D. F., Indianapolis, Ind.
Brown, T. R., Terre Haute, Ind.
Cressler, G. H., Fort Wayne, Ind.
Cressler, A. D., Jr., Ft Wayne, Ind.
Cunningham, J. R., Toledo, O.
Dougherty, J. L., Crawfordsville, Ind.
Dell, J., St. Louis, Mo.
Draper, C. E., Sullivan, Ind.
Fritsch, C. H., St. Louis, Mo.
Gill, W. C., Cincinnati, O.
Harper, H. D., Chicago, Ills.
Hicks, G. C., Connersville, Ind.
Kahn, L., Hamilton, O.
Kellum, B. J., Chicago, Ills.
Little, A. S. B., St. Louis, Mo.
MacNab, A., Indiana.
McNabb, B. C., Kalamazoo, Mich.
Oviatt, J. E., Indianapolis, Ind.
Parker, J. F., Rockford, Ills.
Reilly, J. A., Cincinnati, O.
Shacklette, R., Detroit, Mich.
Smyly, A. L., Chicago, Ills.
Smith, A. M., Cleveland, O.
Walsh, E. J., Indianapolis, Ind.
Weart, S. S., Canton, O.
Wickham, L., St. Louis, Mo.
Wilkins, V. P., Laporte, Ind.

The President—Gentlemen, I will entertain a motion to elect the applicants, as they have been read, to the membership of the Association.

Mr. Carl H. Graf—I move that the Secretary cast the ballot for the election to membership of the applicants whose names have been read.

The President—It has been moved and seconded that the persons whose names have just been read by the Secretary be elected to membership in the Indiana Gas Association. All in favor of the motion will say "Aye." Those apposed "No." [Carried.] The next thing on the programme is the reading of the minutes.

Mr. Carl H. Graf—Mr. President, I will make a motion that we dispense with the reading of the minutes, as they will be published.

The President—Gentlemen, it has been moved and seconded that we dispense with the reading of the minutes. All in favor of the motion will signify it by saying "Aye." Those opposed "No." [Carried.] We will now have the

Report of the Executive Committee.

The Board of Directors, as appointed at the last annual meeting, has continued through the year without any change in its personnel. Vice-President, W. B. MacDonald tendered his resignation in a letter dated Sept. 21, 1909, but the Executive Committee, in recognition of the valuable services rendered to the Association by Mr. MacDonald, adopted a unanimous resolution that no action be taken to fill the vacancy until the annual meeting.

The applications for Active and Associate membership have been approved for recommendation to the Association.

At its meeting held in Indianapolis, Sept. 28, 1909, the Committee carefully considered and selected the topics for the papers to be presented at the annual meeting. It is to be regretted that all the papers recommended in the list could not be secured, but those members of the Association who were unable to accept invitations to prepare papers have promised to contribute them at the next meeting. The programme, however, as finally made up, will be found sufficiently comprehensive to afford a successful and profitable meeting.

A sub-committee comprising Mr. C. H. Graf and the Secretary was appointed to make the necessary arrangements and take care of the details for the annual meeting.

The Board of Directors desire to acknowledge the unceasing and valued efforts of President James W. Dunbar, throughout the year, to bring the Indiana Gas Association to its present high standing among the State Associations.

In accordance with the Amendment to Section 5 Paragraph 17 of the By-laws, it will be necessary that two members be elected to the Board of Directors to fill the vacancies occasioned by the expiration of the term of office of Mr. Carl H. Graf and Mr. S. C. Rowland. The officers and the other members of the Executive Committee commend the valuable work of these excellent officers during their term and extend the thanks of the Committee to Mr. Graf for the use of his office in Indianapolis for the meetings of the Executive Committee since the formation of our Association.

The Committee would express a hope that each individual member of the Association make a personal effort during the coming year to add other Indiana gas men to the membership.

This Committee also desires to record the courtesy extended to representatives of our Association by the Hon. T. A. Marshall, Governor of Indiana, and for his kindly consenting to open the meeting of 1910.

James W. Dunbar, Presdent.
S. T. Murdock,
C. H. Graf,
B. S. Walters,
E. A. Wakeman,
S. C. Rowland,
S. E. Mulholland,
Directors.
Philmer Eves, Sec-Treas.

The President—Gentlemen, you have heard the report of the Executive Committee. What is your pleasure?

Mr. Parker—Mr. President, I move that the report of the Executive Committee be accepted.

The President—Gentlemen, it is moved and seconded that the report of the Executive Committee be accepted. Are you ready for the question? [Question.] All in favor of the acceptance of the report of the Executive Committee may signify it by saying "Aye." Contrary "No." [Carried.] Next in order is the

Report of the Secretary and Treasurer.

Gentlemen: The Report of the Secretary-Treasurer for the year ending Dec. 31, 1909, is respectfully submitted.

The membership at the date of the last report was as follows:

Active	58		
Associate	13		
		— 71	
New members—Active	7		
" " —Associate	12		
		— 19	
		—	90
Resigned	3		
Died	1		
		—	4
			—
Total membership			86

Cash Statement.—*Receipts.*

Balance in bank Jan. 18, 1909		$205.95
Dues of members	$390.00	
American Gas Light Journal—For copy of Proceedings	22.00	
"Progressive Age"	22.00	
Sale of 13 copies of Proceedings	9.75	
		443.75
		$649.70

Expenditures.

Reporting Proceedings—First Annual Meeting	$88.00	
Printing Proceedings	125.00	
Photos and half-tones	13.80	
Printing and stationery	16.75	
Salary of Secretary-Treasurer, 1908-1909	200.00	
Postage and expenses	27.15	
		$470.00
Balance in bank Dec. 31, 1909, as per certified check		179.00
		$649.70
Dues unpaid Dec. 31, 1909	$75.00	

Audited and found correct. (Signed)

JAMES W. DUNBAR, } Auditing
CARL H. GRAF, } Committee.

This Association is in its infancy, being only two years old. This fact may account for the diffidence shown by some of our members when asked to contribute papers for these meetings. Before another annual meeting takes place the Association will have become more matured, and it is predicted that our President will not again have to be disappointed and discouraged by any refusal to prepare papers when any member is requested to do so.

It is, however, questionable whether fewer papers and a more open meeting, for the discussion of local Indiana topics, would not be generally acceptable to our members. It is a pleasure and a good thing to be able to meet our Indiana brothers once a year. This pleasure and profit is proportionate to the time left over from the meetings for friendly talks on our individual experiences, difficulties and discoveries. With this idea in mind, it will be seen that there are fewer papers on our list this year than we had during the last two years, and we shall be glad to have your opinions to-day on this important matter.

The Indiana Gas Association would be neglecting this opportunity if it failed to express its hearty congratulations on the unparalleled success of the convention and exhibit of the National Commercial Gas Association, held in New York during December last. The possibilities of gas and the opportunities we have in our respective territories for the extension of our business was brought home to each one of us as never before in the history of gas. This Association, and, we feel sure, every State Association, will be glad to proclaim its commendation and appreciation, and to subscribe to the opinion that the exhibit of appliances, in connection with the annual meeting, has been and will be educational and of incalculable benefit to the gas fraternity throughout the country.

Respectfully submitted, PHILMER EVES, Secretary-Treasurer.

The President—If there are no objections the report will be accepted as read. Hearing no objection, Mr. Secretary, your report is accepted. In the old Western Gas Association there used to be a custom prevailing of appointing a committee for the receiving and introducing visitors. We have no such committee in this Association, but we have with us to-day a distinguished visitor, who is known of gas men all over America, both for the success that has attended his efforts and for his personality and geniality, for he is one of the most genial and pleasant gentlemen we have ever had come to our Association. I take pleasure in introducing Mr. James T. Lynn.

Mr. James T. Lynn—Mr. President and Gentlemen of the Gas Association, I feel that there is hardly a man here that I do not know and I will say hello to you. I am very glad to be here to-day, and I hope all good things for the success of your meeting and of your organization.

The President—Next in order will be the

PRESIDENT'S ADDRESS.

[For the text of the President's Address, see JOURNAL, *ante*, p. 197.]

The President—Gentlemen, the next in order is the reading of a paper on

PEAK LOADS AND THEIR TREATMENT,

by Mr. J. H. Dykeman, of Evansville.

Mr. J. H. Dykeman—Mr. President and Gentlemen of the convention, it is my unfortunate privilege to have had to write this paper. Unfortunately we are so busy at Evansville fighting with electricity, which is furnished by our own Company, that I have had but little time in which to prepare this short paper.

It has been a "saying" among the men closely allied with the gas industry that dividends are earned in the retort and generating houses. Let me add to this very wise and proper saying that the payment of these dividends is made possible by the proper distribution of the product of the retort and generating houses, and especially so at the time when the greatest demand is being made for that product. This time is recognized, thought of, and preparations made to meet, to the extent no less than the generation. It would profit but little to have the most up-to-date generating equipment and be unable to deliver the results of such equipment at the time when the greatest demand is made. This time has been recognized as the "peak load."

Peak loads have been made possible by the introduction of industrial, domestic and illuminating appliances, to the perfection of which men of brains and recognized ability are devoting their time and energy. In order that these appliances may meet the expectations of these men, and the gas industry thereby reap the benefit of their brains, energy and ingenuity, the gas must be delivered to the consumer at all times, with no variations in quality, volume or pressure and be free from those evils that beset the distribution superintendent, and up to the standard at all times, in all weathers and under all conditions.

Science (that fickle jade) has only in late years designed to give the gas industry but a distant bow; yet the followers of this industry could point to a bright record of benefits conferred upon the community. The incidental benefits of the possibility of handling peak loads and the consequent utilization of the many gas burning appliances and devices made possible by such handling would baffle any but the most encyclopædic mind to enumerate.

The tremendous advance in the distribution methods during the past 10 years has been due also to the new methods of automatically controlling the pressure at any desired point in the system. The old-style method of gas distribution by means of low pressure utilizes such a ridiculously small percentage of the possible conductivity of any given size of pipe that to-day this old-style would not be permissible where intensive peak loads prevail. The old system, where the gas is sent out from the works' holders at not to exceed the maximum pressure thrown by them and the duty obtainable from a given size and length of pipe, is only that due to the differential head or pressure at the extreme end of the pipe and the maximum holder pressure. The modern gas governor or regulator, the compressor or the booster, were not used, and were possibly unknown; distribution depending entirely on the holder pressure and the works' governor.

A quite satisfactory solution of handling the peak load has been worked out where a system of small mains prevail and where the peak load demands a larger volume than the size of the mains and the holder pressure will give. A high pressure belt line, feeding into the low pressure mains at certain well-located points, by means of regulators set to begin delivery into low pressure mains at 36–10 and a No. 5 Sturtevant fan exhauster, running at a speed of 2,300 revolutions per minute, driven by a 5-horse power, 3-phase motor, belt connected, connected to the distributing system by a series of valves controlling the different districts. This Sturtevant fan exhauster or booster is used only at the peak loads, and the operator is in telephonic connection with the four stations, where Bristol pressure gauges are maintained. These stations are located in the business district, West End district, South Side district and the North Side district. In addition to being in telephonic connection with these stations, the operator has a copy of the preceding day's charts before him; also suggestions of such changes in the manipulation of the valves as has been determined upon after a study of the results of the previous day's records.

In operating the booster the holder outlet valve is closed; all gas passing through the district valves leading from the booster, at the same time the compressor is speeded so as to insure maximum delivery at the regulators; the booster and the compressor working in conjunction to the one end—equal distribution at all points.

In conjunction with the pressure recording gauges, a weekly record during the peak load is taken by means of U-gauges at points in the four districts other than the recording stations, and charts plotted for present information and future reference. By this system a serious naphthaline stoppage in one of the mains feeding an outlying district was detected and immediately steps were taken to overcome the difficulty.

The peak loads vary in length of time, depending upon weather conditions and day of week. From May until the middle of October accounting must be made of the noon or stove load. From September to April accounting must be made of lap loads, and on shipping night, which with us is Saturday night, the load, though no sharper, is longer.

During the peak load the operator is on duty, and it is his sole business to keep in touch with the conditions at the different stations, and

so manipulate his district valves that he may deliver to each district the maximum volume of gas required.

Gentlemen, I have here a chart taken just at the time our maximum peak loads prevailed and I will pass it around to show you the results of our system. It is perhaps a wise solution, or a good solution of the conditions under which we are working. [The chart was passed around to the members of the Association.]

(To be Continued.)

Promoting Gas Sales in a Small Town.

[Prepared by MR. A. V. WAINWRIGHT, New York, for the Fifth Annual Meeting, National Commercial Gas Association.]

In a town of approximately 20,000 population is usually to be found a high grade of civic pride, an active interest in municipal affairs and healthy business competition, stimulating trade. Each business man, or public-spirited citizen, plumes himself upon this condition, since it indicates that his town has a clean bill of business health." The interest taken by the public in public utility companies is of an entirely different character from that to be found in large cities—this due in part to the personnel of the corporation, in part to its methods or its attitude in regard to public policy. This interest should in in every case have a most favorable effect upon the procuring of new business.

In a city of this size one usually expects to find electrical competition, but this is of more benefit than detriment, isasmuch as competition is often a valuable factor in obtaining the maximum sales per meter. Rivalry created in this manner keeps the gas man on his mettle. Such a condition requires the manager to be in constant touch with all details of the business, for the size of the company prevents many sub-heads, and on account of his wide acquaintanceship in town he must necessarily be able to handle any case at short notice. This knowledge of detail is most important—not only that he may appreciate the public attitude, but that he may be assured that his management is conducive to low operating expenses. The manager *must* be thoroughly conversant with all branches of the business.

The commercial department in a city of this size should consist of one man, under the direct supervision of the manager. It has been found that one salesman per 20,000 population is sufficient to care for the average town. This salesman must, by force of circumstances, be a good mixer, familiar with all branches of gas operation—particularly distribution and accounting—and thoroughly conversant with the best methods of augmenting the sales of the company. He must be capable of controlling the attitude of the men in the operating department to the extent of having each and every one co-operate with him. He is an active man in commercial work, and as such is responsible for conditions. His knowledge of matters of company interest must be such that he will find it necessary to confer at frequent intervals with the manager for the purpose of determining the policy to be pursued, ways and means of introducing appliances, of interesting the public in his product and retaining their goodwill (which is most essential). In combating competition, he should adopt open and above-board methods.

Having selected the salesman, the manager first obtains his confidence and by co-operation will be enabled to plan and outline methods of campaign which the salesman in his routine work often loses sight of. The first step in a new business campaign is to employ methods which will insure an accurate record of the installations in each household, store, factory, etc. This can only be done by a house-to-house canvass. These records having been compiled, they should be kept up to date and made use of—not only in the ordinary routine work, but in connection with the writing of circular letters, by which means much business can be obtained without the necessity of a call, unless the letter should be used, preferably, as an entering wedge to such a call. The card index may be classified as residential, commercial, industrial and municipal, each class being studied for the purpose of determining the maximum number of appliances that can be made use of in each individual case. For instance, in order to add variety to the salesman's work and to avoid too frequent house-to-house calls upon present or prospective consumers, a campaign may be arranged so as to specialize for a given time upon some one class. Each class, of course, will require individual methods of handling, and therefore no plan can be inflexible; but when a plan for a class is finally fixed upon it should be adhered to strictly. Otherwise, results are not so good. In this work the best returns are to be obtained from the devotion of energy to the present consumer. It is a comparatively simple matter to procure business along new lines; in many cases this comes without effort; but the returns to the company from increasing the sales on present installations are the most to be desired, and with conscientious work these are not difficult to obtain. Most manufacturers of the appliances used will furnish the company with advertising matter which can be applied in circular work or as a preliminary hint before the salesman's call. It is always well to leave in the hands of the prospective consumer a reminder which will retain his interest after the salesman has departed. It has been found that many sales are brought about by simply leaving a cut of a range, or other appliance, when the prospective purchaser is occupied and cannot give the salesman his attention.

In combating electrical competition—particularly that of the tungsten lamp—some companies have gone so far as to introduce the combination gas and electric reflexolier such as is made by a well-known firm. It has been found that the consumer prefers the lighting effect of the gas lamp to that of the tungsten, and if suitable means of ignition and extinguishing be employed will use gas rather than the tungsten lamp. Even when the reflexolier is installed—possibly as break-down service—when the comparative lighting effects are noted by the consumer, the tungsten lamp is superseded. In connection with the introduction of reflexoliers, it is preferable to have a maintenance contract executed. Otherwise the glassware will cause annoyance and complaint.

It is not deemed advisable to spend any great amount of money on advertising methods which call for spasmodic efforts in getting business. Greater returns can be had from conscientious, consistent and *constant* work. The salesman who can stick to the ship, even though conditions seem to be against him, is the one who will ultimately win out. Within the last few months we have had occasion to note the closing of large power prospects on which our salesmen have been working for a long period, the first call resulting in no hope of signing a contract whatever. By gradual persistence, however, as they obtained the confidence of the prospective consumer, the day was won. Bombastic methods of obtaining business are of little value and often result in injury rather than good. The company can accomplish its purpose much more rapidly, with better feeling on the part of the public and more security on their own side, by clean, businesslike methods. Catch-penny exploits are soon forgotten and serve to leave in the minds of the public a poor impression of the company's policy.

With a competent salesman, alive to the situation, a manager who is thoroughly conversant with up-to-date commercial methods and practices, and earnest effort on the part of both in the directions we have endeavored to point out in the foregoing, we should have no doubt as to the supersession of gas as a household as well as an industrial commodity.

Discussion.

Mr. J. P. Quigg—I believe that the closing paragraph of Mr. Wainwright's very able paper contains the secret of successfully promoting the sales of gas in any town. Our experience in a town of 20,000 inhabitants has been such as to cause us to differ with Mr. Wainwright on two points; the first is that one salesman is enough to take care of a town of 20,000. We have had three salesmen and find that with that number we are able to keep in as close touch with the customers as we think the business demands. They make a house-to-house canvass twice a year, keep a record of all installation, follow up newcomers and watch all new buildings. The second point is that it is not a simple matter to procure new business along new lines, and we do not find that our efforts can be abated one bit less on new lines than on the old. Architects frequently fail to specify piping in new houses, fixtures are being made in such a way that it is almost impossible to use gas; laundry coal stoves are being used for heating water both winter and summer, and unless vigorously pushed automatic heaters will not be used. Unless we get to work as soon as we hear of a new building we find that some very important part of the gas equipment has been overlooked. We follow much the same methods suggested in Mr. Wainwright's paper. Our newspaper advertising is done in a systematic way by our publicity department. On the back of our gas bills we tell the various ways in which gas may be used. All bills and receipts mailed from the office contain literature explaining the many and useful appliances for sale, our showrooms and display window is also a source of profitable advertising. The salesmen are in close touch with real estate men and have advance information of any newcomers to our town, thus being

able to place in their hands application and appliance literature before they arrive in town. We have a special report whereby we get information of a building or a proposal to build; we then get in touch with the architect and see that the building is piped and proper fixtures installed. At this time we also try and show the advantages of the furnace connection and automatic water heater. By doing this at an early stage of the building we have been able in a number of cases in doing away with kitchen coal range and laundry coal heaters.

Meeting Times of the Various Gas Associations.

American Gas Institute.—Annual meeting, October, 1910. Atlantic City, N. J. Officers: President, Wm. H. Bradley, N. Y., City; Secretary, A. B. Beadle, 29 West 39th street. N. Y. City.

Canadian Gas Association.—Annual meeting, June, 1910. Hamilton, Ont Officers President, J. S. Norris, Montreal, P. Q.; Secretary and Treasurer, A. W. Moore Woodstock, Ont.

Empire State Gas and Electric Association.—Annual meeting, Nov., 1910. New York City. Officers: President, C. R. Huntley, Buffalo, N, Y.; Secretary, C. H. B. Chapin, 29 W. 39th street. New York City.

Guild of Gas Managers of New England.—Annual meeting, December. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, A. K. Quinn; Newport, R. I.; Secretary, Walter G. Africa, Manchester, N. H.

Illinois Gas Association.—Annual meeting, time, March 18, 1910, Chicago, Ills. Officers: President, E. G. Schmidt, Springfield, Ills.; Secretary-Treasurer, C. B. Strohn, Elgin, Ills.

Illuminating Engineering Society.—Annual meeting, January —, 1911. Meetings of Sections, monthly. President, W. H. Gartley, Philadelphia, Pa.; Secretary, Preston S. Millar, 29 W. 39th street, N. Y. City. Sections: New York: Secretary, Albert J. Marshall, 227 Fulton street. New England, Secretary, L. D. Gibbs 39 Boylston street, Boston, Mass. Philadelphia, Secretary, F. N. Morton, Broad and Arch streets. Chicago, Secretary, T. R. Beebe, 157 Michigan avenue,

Indiana Gas Association.—Annual meeting, January 19, 1911, Fort Wayne, Ind. Officers President, Carl H. Graf, Indianapolis; Vice-President, S. E. Mulholland; Secretary-Treasurer, Philmer Eves, Indianapolis Gas Company, Indianapolis, Ind.

Iowa District Gas Association.—Annual meeting, time, June 23, 24, 25, 1910, Sioux City, Ia. Officers: President, Geo. H. Waring, Omaha, Neb.; Secretary and Treasurer, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, time, ———— Wichita, Kas. Officers: President, W. A. Scothorn, Hutchinson, Kas.; Secretary and Treasurer, J. D. Nicholson, Newton, Kas.

Michigan Gas Association—Annual meeting, time, September, 1910; ———— Officers: President, B. O. Tippy, Grand Rapids, Mich.; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April 14, 15 and 16, 1910; Jefferson City, Mo. Officers: President, W. A. Bixby; Secretary and Treasurer, C. L. Clary, Sikeston, Mo.

National Commercial Gas Association.—Annual meeting, third week in October, 1910: Boston. Officers: President, E. N. Wrightington, Boston; Secretary, Louis Stotz, 36 West 39th street, New York City.

Natural Gas Association.—Annual meeting, May 17, 18 and 19, 1910; Oklahoma City, Okla. Officers: President, William H. McKenzie, Kansas City, Kas.; Secretary, T. C. Jones, Delaware, O.

New England Gas Association.—Annual meeting, third Wednesday in February; Boston. Officers: President, Walter G. Africa, Manchester, N. H.: Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

Oklahoma Electric Light, Railway and Gas Association.—Annual meeting, May 18, 19 and 20, 1910; Oklahoma City. Officers: President, F. H. Tidman, Oklahoma City, Okla.; Secretary-Treasurer, Galen Crow, Guthrie, Okla.

Pacific Coast Gas Association.—Annual meeting, Sept. 20, 21 and 22, 1910, Los Angeles, Cal. Officers: President, W. B. Cline, Los Angeles, Cal.; Secretary-Treasurer, John A. Britton, 925 Franklin street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, April 13, 1910, Easton, Pa. Officers: President, E. G. Holzer, Easton, Pa.: Secretary-Treasurer, William H. Merritt, Lebanon, Pa.

Society of Gas Lighting.—Annual meeting, December, 1910; monthly meeting, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 1123 Broadway, New York.

Southern Gas Association.—Annual meeting, Feb. 16, 1910, Chattanooga, Tenn. Officers: President, R. C. Congdon, Atlanta, Ga.; Secretary-Treasurer, James Ferrier, Rome, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. ————, 1910, Beaumont, Tex. Officers: President, R. B. Stichter, Dallas, Tex.; Secretary's office, 300 Commerce street, Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May 11 and 12, 1910, Milwaukee, Wis. Officers: President, R. B. Brown, Milwaukee, Wis.; Secretary-Treasurer, H. H. Hyde, Racine, Wis.

Items of Interest
FROM VARIOUS LOCALITIES.

SUIT has been brought by the bondholders of the old Lacombe plant at Denver for the redemption of bonds, irrespective of their value as revenue producers.

DESPITE the lengthening days, the sendouts in several New Jersey towns are increasing so rapidly that orders for new holders have been placed, the erection to begin at once. The Hammontown and Pleasantville (N. J.) Gas Companies under the direction of Mr. John P. Tompkins, and the Glassboro (N. J.) Company presided over by Mr. Frank B. Aldrich, have made arrangements as above noted with the Cruse-Kemper Company.

No changes of note have occurred in St. Louis, Mo. Mr. A. S. Miller was elected President of the Union Electric Light and Power Company, and Mr. C. H. Holman was recently re elected Vice-President and General Manager of the Laclede Gas Light Company. The report of the latter Company for the year ending December 31, 1909, contains the following figures:

	1909.	1908.	Increase.
Gross	$4,142,350	$3,716,406	$425,944
Net	1,901,741	1,779,659	122,082
Surplus of charges	897,647	677,421	120,226
Preferred dividends.	125,000	125,000	.....
Common dividends.	510,000	425,000	85,000
Surplus	262,647	227,421	35,226

APROPOS of the methods of demanding a deposit from consumers in the State of New York, which is agitating the up-State Public Service Commission, a case argued before Judge Murphy, of Detroit, Mich., may be of interest. The Detroit City Gas Company asked for $7,542, which passed not through but around the gas meter of one George J. Schindler, saloonkeeper. The necessary piping was not of the Gas Company's devising. The verdict in favor of the Gas Company amounted to $1,116.

ACCORDING to the report of City Auditor Grimmer the Municipal Gas Works, of Hamilton, O., show a loss of $9,174.17, with comsumers numbering 5,072.

COL. IRA C. COPLEY, President of the Western United Gas and Electric Company, has apparently taken the bull by the horns in the matter of rates and supply at Elgin, Ills., for he has demanded public and not private meetings concerning these matters.

THE regular quarterly dividend of 1¼ per cent. of the preferred stock of the Pacific Gas and Electric Company, is payable to-day to the holders of record of the 1st inst.

THE Ashtabula (O.) Gas Company shows a gain of over 300 consumers for the past year, and that Manager F. W. Stone has been re-elected will surprise none of his numerous friends, whether they be of the old "Ohio Association" or not.

THE plans of the W. M. Crane Company for their new works at Greenville, N. J., are well underway, and at least $100,000 is to be invested according to present arrangements.

THE Port Huron (Mich.) Gas Comyany has accepted the franchise offered by the city, and will hereafter charge at the rate of 90 cents per 1,000. While the matter has been in controversy during the past 4 months, the Company has been charging $1 per 1,000, and the difference for this period is to be rebated. This will amount to some $2,500.

SIMPLEX ECONOMY APPLIANCE COMPANY, of Chicago, Ills., was recently incorporated with a capital of $100,000, to manufacture and deal in gas lamps, stoves and other apparatus. The following are named as incorporators: Otto F. Reich, J. P. Nagel and C. E. Stridings.

THE Lees Gas Governor Company, of Philadelphia, Pa., has been incorporated to manufacture and sell gas governors, etc., with capital of $150,000.

THE Northampton (Mass.) Gas Light Company will be officered by men affiliated with the Massachusetts Lighting Company interests. At the annual meeting on the 31st ult. the following officers were elected: President, Alfred Clark; Vice President, Arthur E. Childs; Secretary, George T. Howland; Treasurer, Addis M. Whitney. They were also elected Directors to serve with Mr. C. M. Bunnell. The Superintendent, Mr. Frank A. Goodwin, and the New Business Man, Mr. R. M. Starkweather, will remain.

IF the present plans are carried out, two new gas works will shortly be erected in Northumberland county, Pa., at Northumberland and Point Township.

ANOTHER case of hold-up has been fought to a successful issue by Mr. W. B. Cline, President of the Los Angeles Gas and Electric Company. It seems that the Company had adjusted certain accounts by returning part of the amount received from one of their consumers in two instances. When a third demand was made upon the Company it was refused, and thereupon the consumer, with the aid of the public prosecutor, attempted to show that the former allowances were rebates and, therefore, illegal. The case was dismissed.

ON and after April 1, 1910, gas will be supplied to consumers in Providence, R. I., at 90 cents per 1,000. President John W. Ellis recently stated that the business of last quarter of 1909 showed an increase of some $20,000, as compared with the previous year, and the city has received a correspondingly larger amount on franchise account.

FRIENDS of Mr. J. J. Knight, of Kalamazoo, Mich., will be glad to learn that the attack of ptomaine poisoning with which he has been suffering will have no serious consequences. He will probably be about in a few days.

"GAS-PS," the clever little booklet issued by the Suburban Gas Company, of Chester, Pa., contains the following for February:

Hygiene of Gas Lighting.—It is not generally known that the use of gas lights in a room or store constitutes one of the best forms of ventilation. The heat radiating from the light maintains a constant, gentle motion of the atmosphere, carrying the impure air and the impurities, a large part of which are destroyed by the flame itself, through open doors and through the unnoticed cracks and crevices that are in every room. This ventilation is going on quietly, constantly and unobtrusively, without fuss or feathers or sudden blasts of cold air, and that is the reason why the unanalytical do not recognize the hygienic quality of gas illumination.

Surely the truth needs no varnishing, and this simple explanation will go a long way towards satisfying and making glad those former electric consumers who have been visited by Mr. Thompson or his aides.

THIS looks like a big year in the matter of improvements, for among those down for increased capacity are Independence, Mo., and main extensions will begin shortly at Superior, Wis., and Boone, Ia.

THE decision of the Massachusetts Gas and Electric Light Commission concerning reduction of rates at Beverly, Mass., is one of considerable importance. The Commission stated that the Company could not provide for extensions out of income. The concluding portion of the decision reads as follows:

"Of the gross expenditure of the Company, under its present management, for new construction, more than one-third, or upward of $180,000, has been obtained from earnings, and a large part of this in the more recent years. These figures indicate that, notwithstanding the numerous and fairly frequent reductions in price made by the Company, the profits, in excess of dividends, which have been used to extend and improve its plant, have been larger than can readily be adjusted in view of the duty which the Company owes to the public. In the early days of public service corporations such a policy was very general and justified by the belief that, as the capital charge was kept low and the amount per unit required for dividends decreased, low prices might be more certainly and quickly attained. If, however, the claim now made by some companies is to be conceded and the same return is to be allowed upon the value of all property employed for the public convenience from whatever source derived, no benefit accrues to the public from such accumulation. If the claim can be successfully made, it amounts in effect, if not in form, to a stock dividend. Nor is such a claim necessary to insure a continuance of the commercial prosperity of companies of this class.

"The public has a substantial interest in what remains of the net earnings above a fair dividend. No corporate interest properly viewed requires that such surplus be distributed to the stockholders or so invested as to impose new burdens on consumers. A public service corporation, exercising a virtual monopoly, is bound to give its customers the best possible service at the lowest reasonable price, nor is the discharge of this duty to be measured merely by a comparison with the service and price prevailing elsewhere. After a payment of reasonable operating expenses, proper allowance for depreciation and emergencies, and a fair return upon the investment, surplus earnings should be used to facilitate further reductions in price. The Board is convinced that this Company no longer needs to continue, as heretofore, to provide capital for extensions out of income. As soon as the combined effect of the recent reductions and the necessary prospective expenditure and changes shall be realized, if profits shall then exceed dividends, as in some former years, it will be the plain duty of the management to make a further revision of existing rates. The question of the price for street lighting was not considered at the hearing, but since December 1, 1909, the price of arc lighting for this purpose has been reduced from $90 to $85 per lamp per year."

In view of the facts and considerations stated, the Board voted to dismiss the petition.

THE "Standard" Compressometer, manufactured by the Industrial Instrument Company, of Foxboro, Mass., is the title of a little folder which should interest automobile users.

PUBLIC LIGHTING TABLES FOR FEBRUARY, 1910.

These tables are those used for computing the various times during the year, for New York and vicinity, when public lamps of all sorts are to be lighted and extinguished. As will be seen they include the all night and every night practice, and the moontable schedule as well. They were compiled by the American Meter Company, New York city.

Table No. 1.
FOLLOWING THE MOON.

Day of Week.	Date.	Light.	Extinguish.
		P.M.	
Tue.	1	5.50 L.Q.	1.30 A.M.
Wed.	2	5.50	2.30
Thu.	3	5.50	3.30
Fri.	4	5.50	4.40
Sat.	5	5.50	5.40
Sun.	6	6.00	6.00
Mon.	7	6.00	6.00
Tue.	8	6.00	6.00
Wed.	9	6.00 N.M.	6.00
Thu.	10	6.00	6.00
Fri.	11	6.00	6.00
Sat.	12	6.00	6.00
Sun.	13	6.00	5.50
Mon.	14	10.10	5.50
Tue.	15	11.30 F.Q.	5.50
		A.M.	
Wed.	16	12.40 F.Q.	5.50
Thu.	17	1.50	5.50
Fri.	18	2.50	5.50
Sat.	19	3.50	5.50
Sun.	20	4.40	5.50
Mon.	21	5.20	5.50
Tue.	22	No L.	No L.
Wed.	23	No L. F.M.	No L.
Thu.	24	No L.	No L.
Fri.	25	6.20 P.M.	8.20 P.M.
Sat.	26	6.20	9.20
Sun.	27	6.20	10.20
Mon.	28	6.20	11.20

TOTAL HOURS DURING 1910.

	Hrs. Min.
January	229.00
February	188.20
March	184.10
April	161.40
May	152.00
June	136.50
July	146.20
August	165.50
September.	181.30
October	217.10
November.	224.50
December	249.30
Total, year	2237.10

Table No. 2.
NEW YORK CITY.
ALL NIGHT LIGHTING.

Day of Week.	Date.	Complete Lighting in 1 Hour.	Complete Extinguishing in 50 Minutes.
		From Time Given.	
		P.M.	A.M.
Tue.	1	4.47	6.07
Wed.	2	4.47	6.07
Thu.	3	4.47	6.07
Fri.	4	4.47	6.07
Sat.	5	4.57	6.02
Sun.	6	4.57	6.02
Mon.	7	4.57	6.02
Tue.	8	4.57	6.02
Wed.	9	4.57	6.02
Thu.	10	4.57	6.02
Fri.	11	4.57	6.02
Sat.	12	5.07	5.57
Sun.	13	5.07	5.57
Mon.	14	5.07	5.57
Tue.	15	5.07	5.57
Wed.	16	5.07	6.52
Thu.	17	5.07	5.52
Fri.	18	5.07	5.52
Sat.	19	5.17	5.47
Sun.	20	5.17	5.47
Mon.	21	5.17	5.47
Tue.	22	5.17	5.47
Wed.	23	5.17	5.42
Thu.	24	5.17	5.42
Fri.	25	5.17	5.42
Sat.	26	5.22	5.32
Sun.	27	5.22	5.32
Mon.	28	5.22	5.32

TOTAL HOURS DURING 1910.

	Hrs. Min.
January	428.30
February	358.15
March	353.10
April	298.10
May	263.20
June	234.45
July	248.30
August	278.00
September.	311.25
October	370.05
November.	397.40
December	438.35
	3980.25
Deduct on account of 50 minutes extinguishing time....	30.25
Total, year	3950.00

THE AMERICAN GAS LIGHT JOURNAL

The Market for Gas Securities.

The market quotations show little variation from those of last week, and there have been no sales of note.

The Port Townsend (Wash.) Gas Company has been absorbed by the Citizens Electric Company, of that city.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

FEBRUARY 14.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$73,177,000	100	142½	143
Central Union Gas Co. — 1st 5's, due 1972, J. & J.	3,000,000	1,000	98	101
Equitable Gas Light Co.— Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	2,500,000	100	155	165
New Amsterdam Gas Co.— 1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	101½
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	100	101
New York and East River— 1st 5's, due 1944, J. & J.	3,500,000	1,000	104	107
Con. 5's, due 1945, J. & J.	1,500,000	—	97	101
Northern Union— 1st 5's, due 1927, J. & J.	1,250,000	1,000	94	100
Standard	5,000,000	100	—	75
Preferred	5,000,000	100	70	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	148	150
1st Con. 5's, due 1948, M. & N.	15,000,000	—	93	99
Yonkers	200,650	500	150	—
Out-of-Town Companies.				
Bay State	50,000,000	50	⅝	11-16
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	500,000	1,000	90	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	73	73½
Capital, Sacramento	800,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,660,000	1,000	104	105¼
Cincinnati Gas and Electric Co.	29,500,000	100	92	93
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90½	91
Preferred	3,025,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	—	105
Mortgages, 6's	3,600,000	—	—	118
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	458,000	—	102	105
Detroit City Gas Co	5,000,000	50	—	50
" Prior Lien 5's	4,819,000	1,000	97	100½
Detroit Gas Co., 5's	381,000	1,000	75	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	112	113½
" Bonds, 5's	10,500,000	—	103	103½
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis	10,000,000	100	106	106½
Preferred	2,500,000	100	—	98
Bonds	10,000,000	1,000	104	—
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,370,000	50	143	145
Madison Gas and Electric Co. " 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	77	77½
Preferred	25,000,000	100	95	95¼
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
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New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	107½	108
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104⅜	105½
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.— 1st Mtg. 5's	751,000	1,000	100	102
St. Paul Gas Light Co.	1,500,000	100	45	47
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General Mortgage, 5's	2,465,000	1,000	90	95
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
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Washington (D. C.) Gas Co.	1,600,000	200	360	380
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Western Gas Co., Milwaukee	4,000,000	—	—	—
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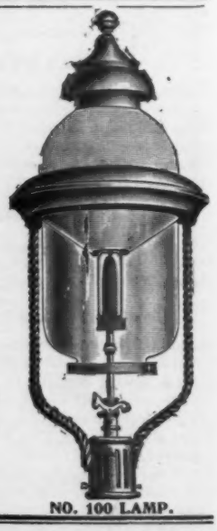

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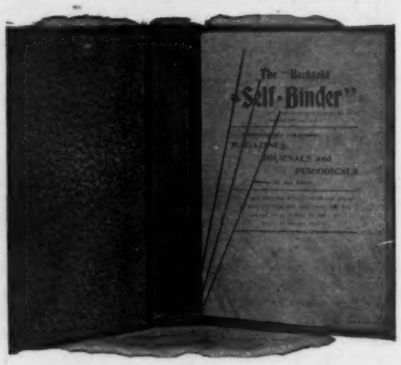

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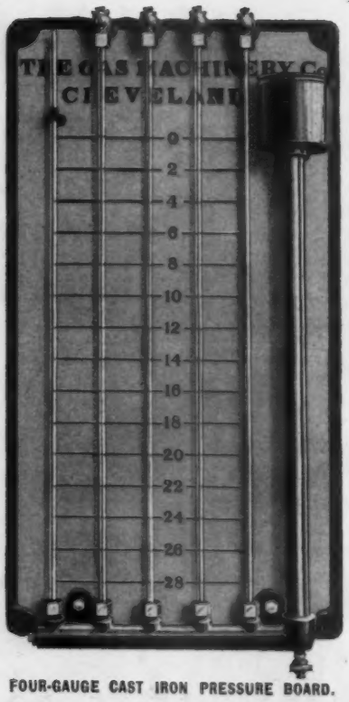

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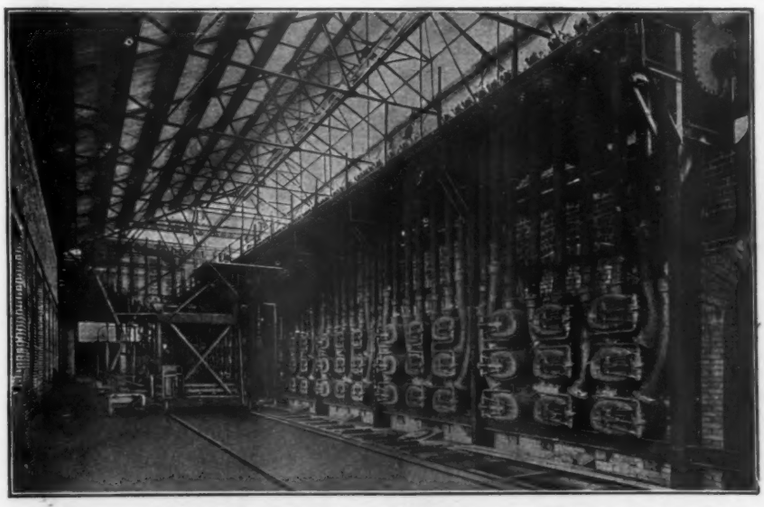

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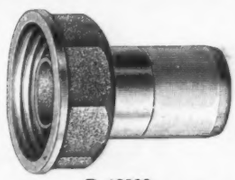

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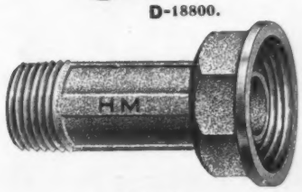

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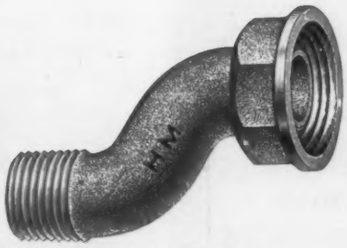

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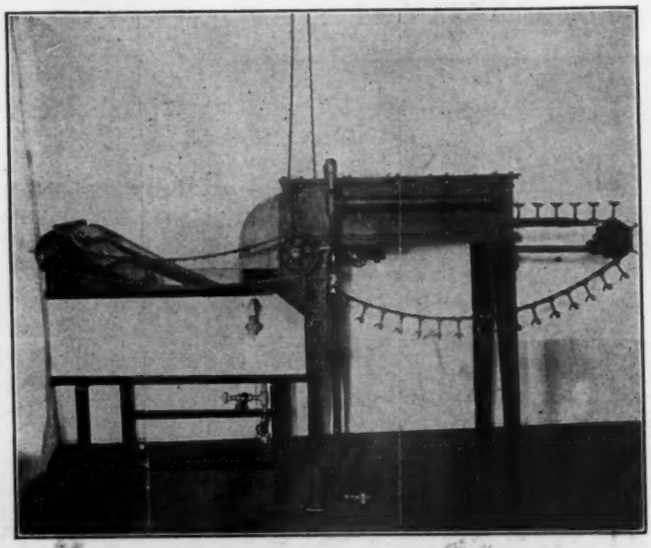

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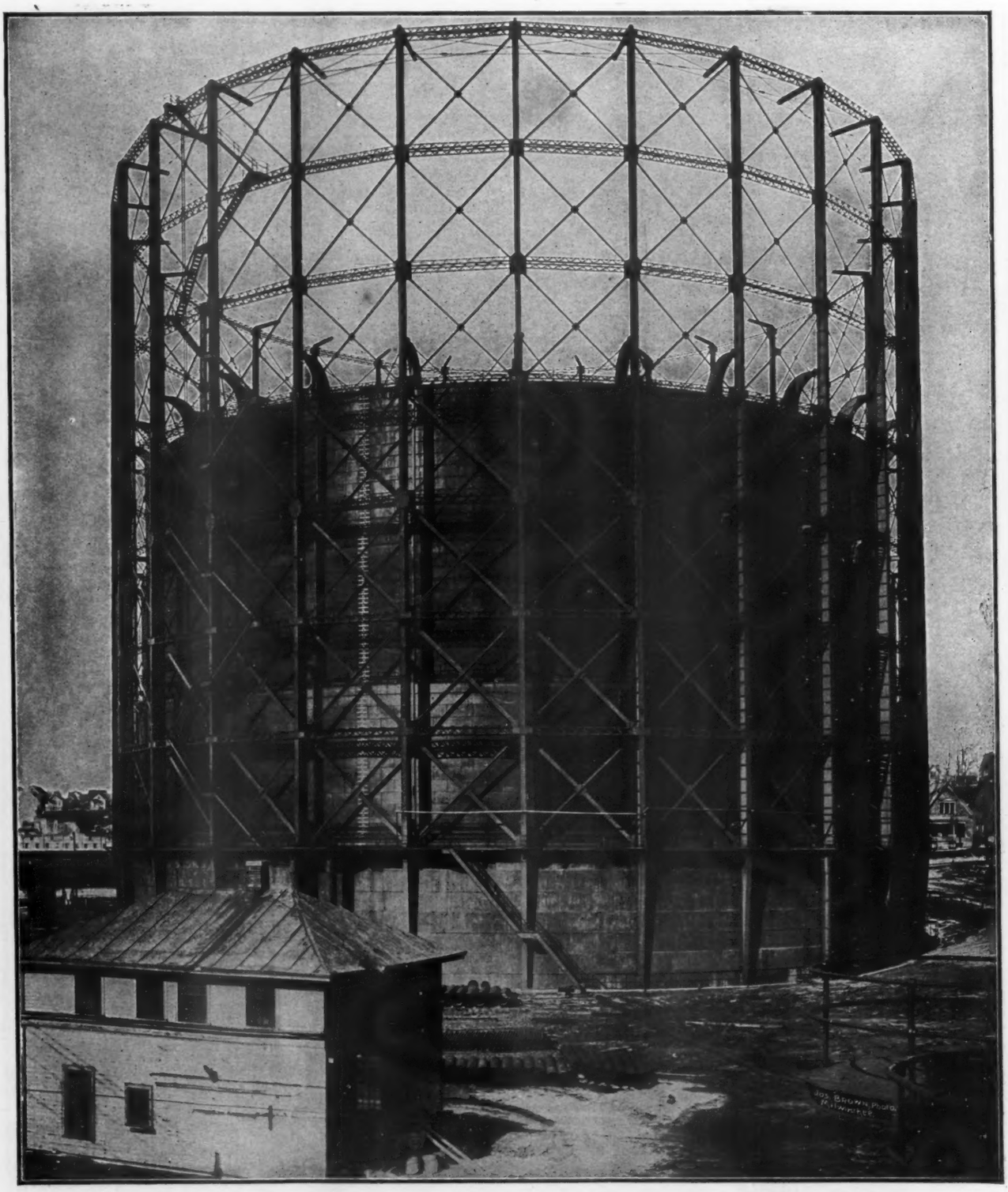

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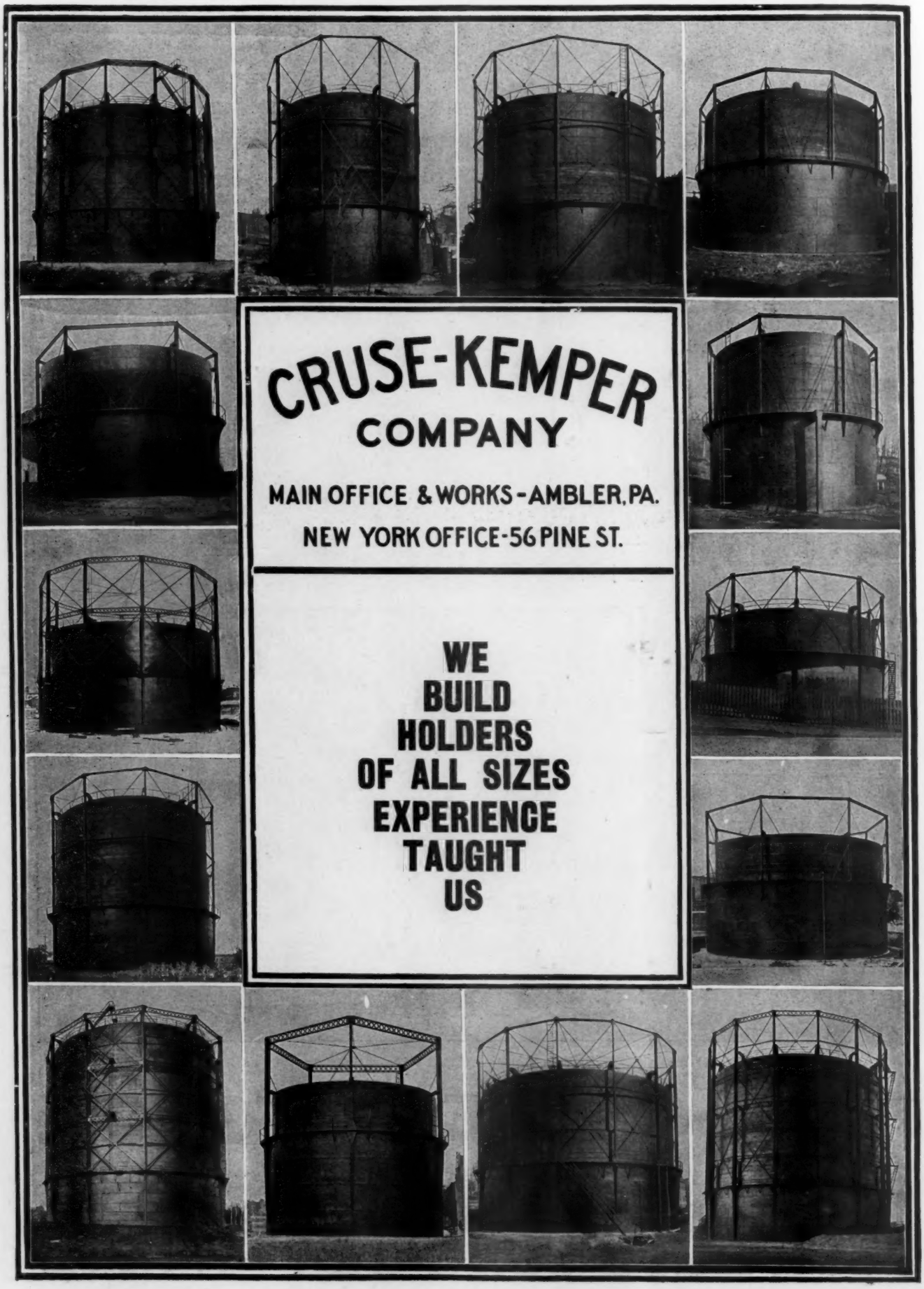
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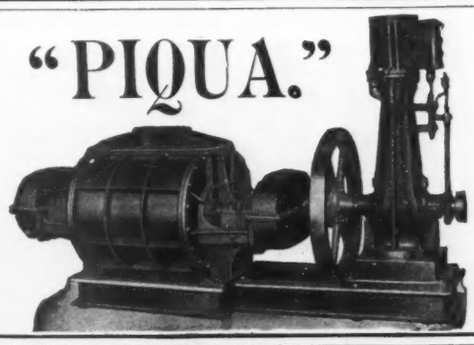

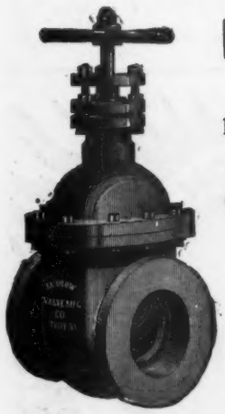

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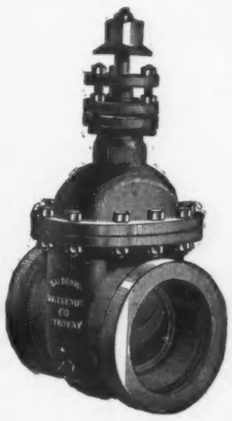

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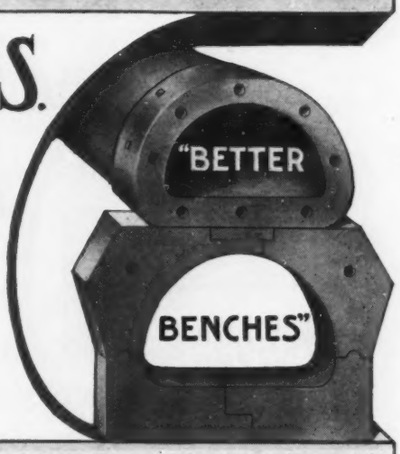

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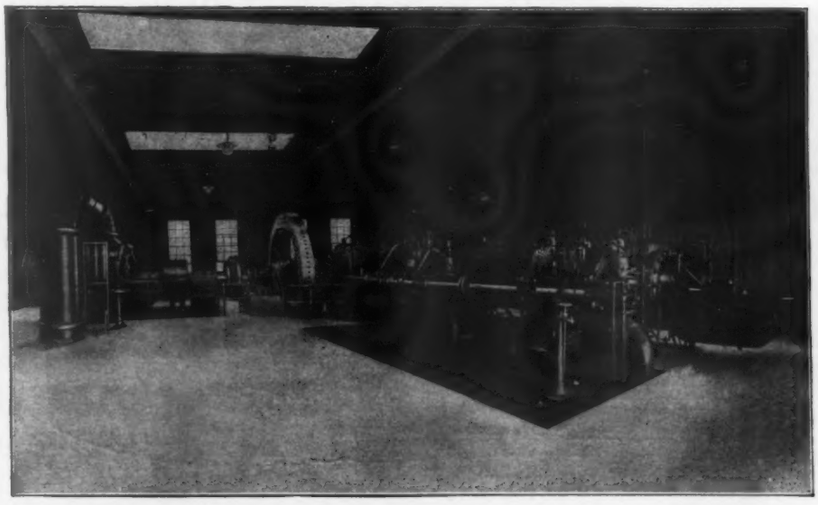

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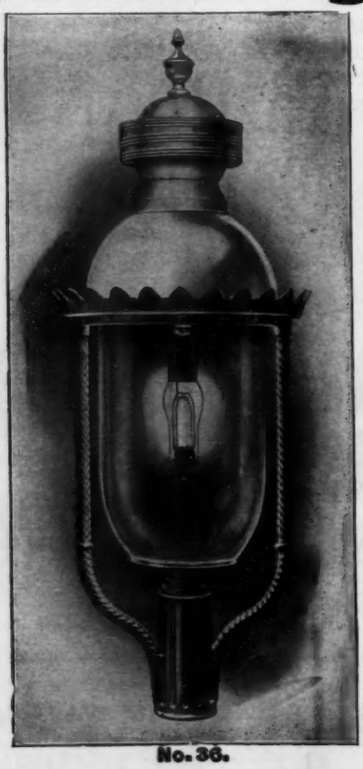

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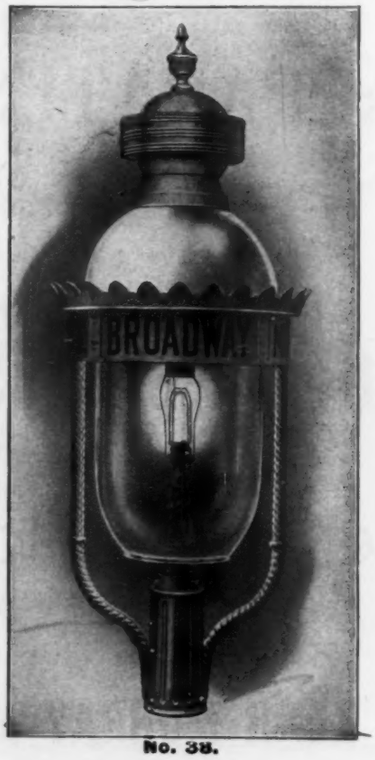

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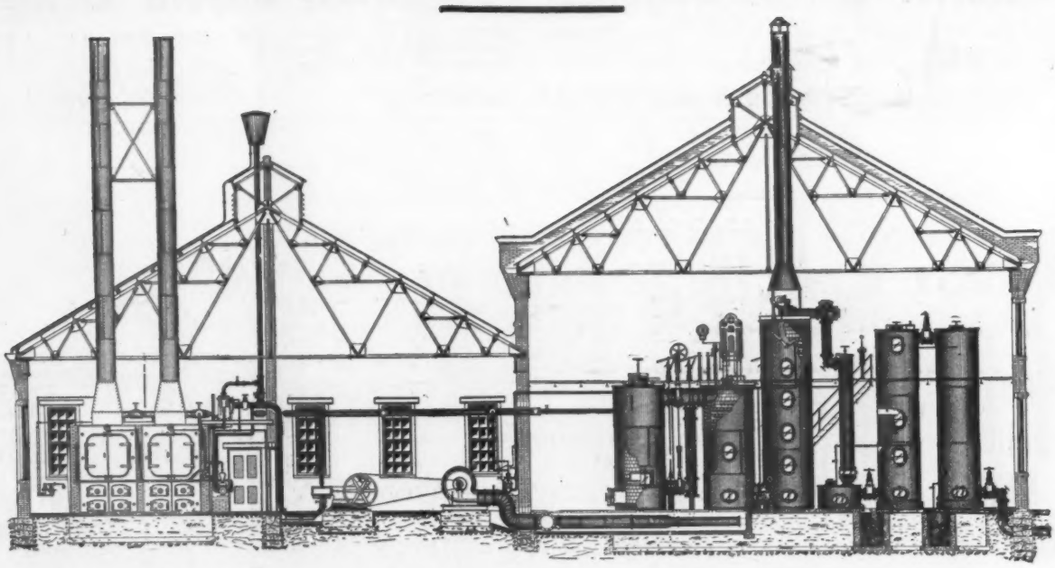

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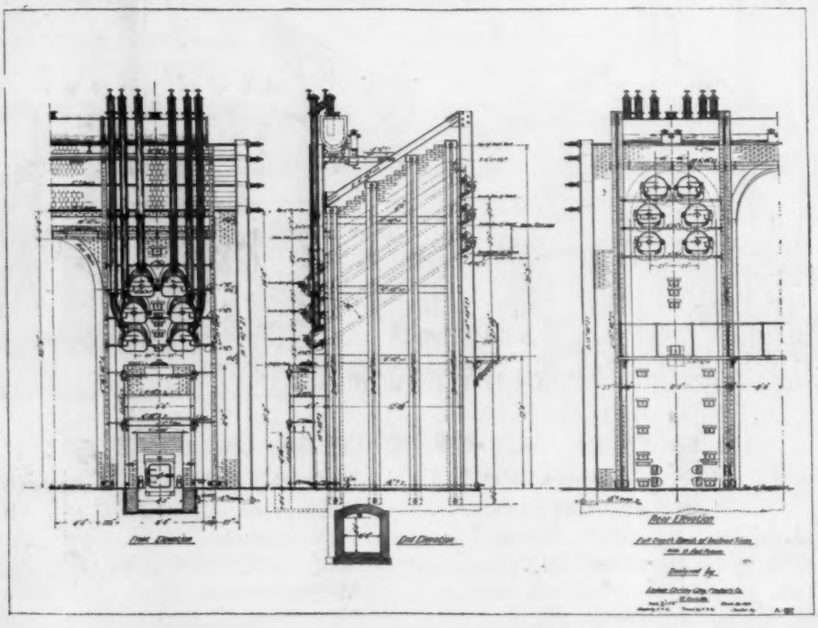

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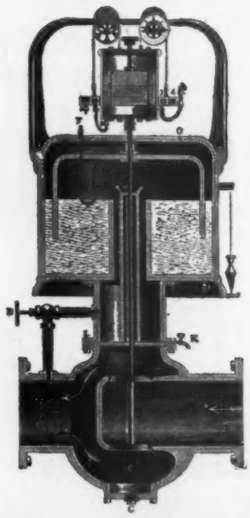

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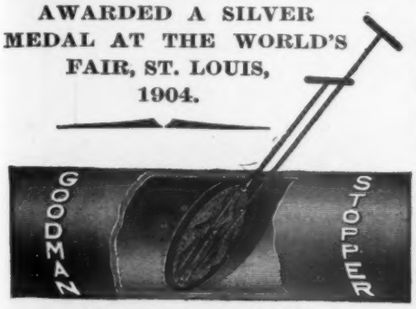

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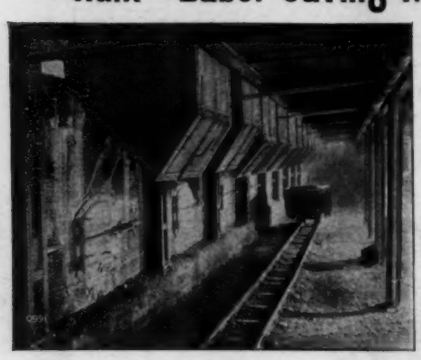

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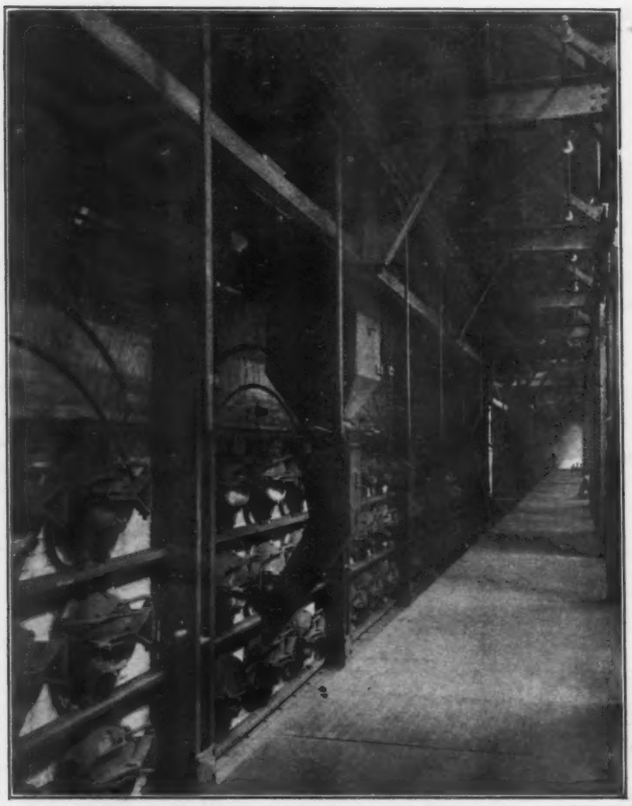

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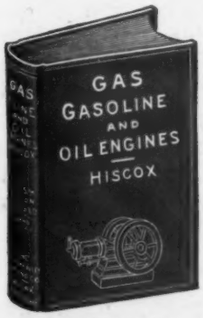

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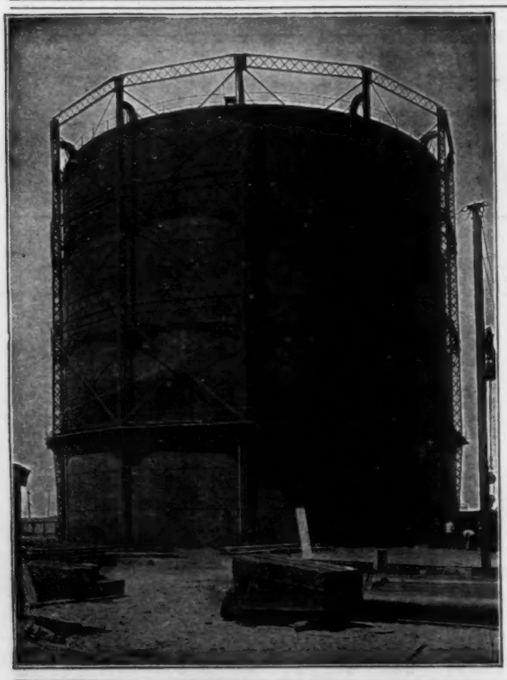

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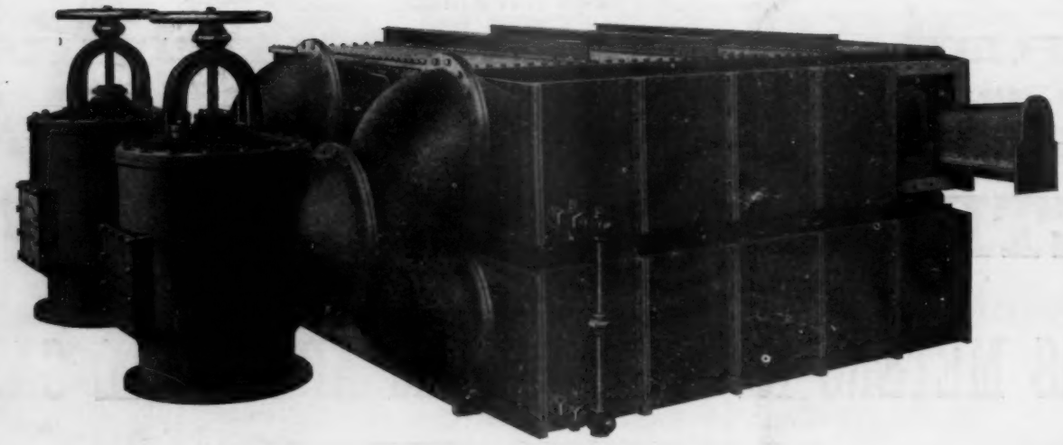
DOUBLE DECK WASHER.



Another view of the Washer especially constructed for the Pacific Gas and Electric Company, Oakland, Cal.

Dimensions, - - - 8 feet x 10 feet x 5 feet 6 inches.
Capacity, - - - - - 8,000,000 cubic feet per diem.
Connections, - - - - - - - - - - - - - 24-inch.

WE BUILD APPARATUS TO MEET SPECIAL CONDITIONS.

See A. G. L. J., Jan. 31, 1910.

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